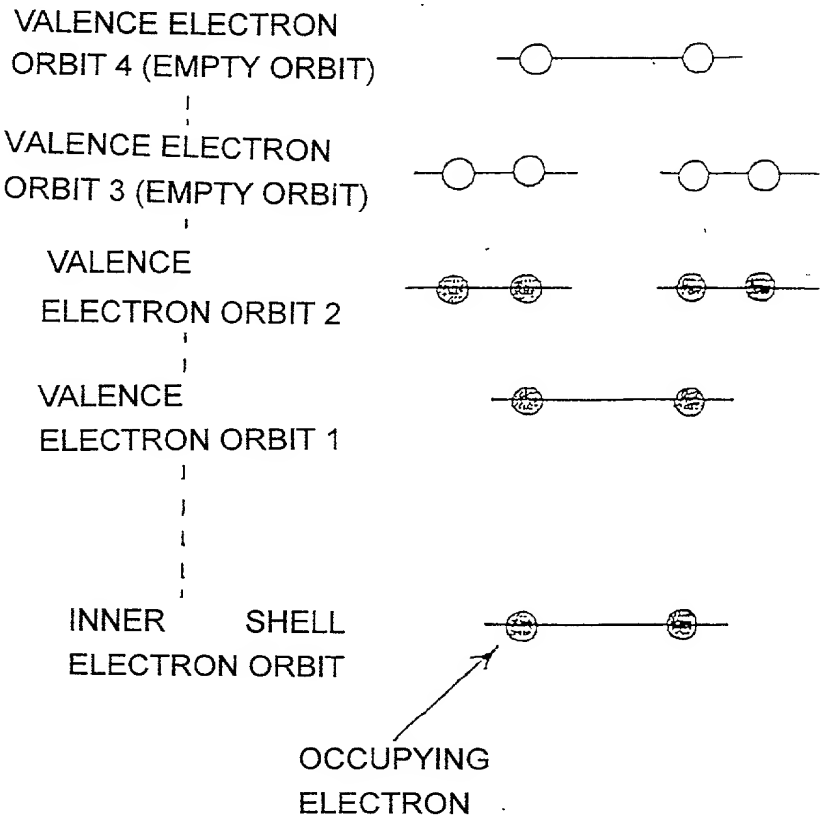

VALENCE ELECTRON
ORBIT 4 (EMPTY ORBIT)
VALENCE ELECTRON
ORBIT 3 (EMPTY ORBIT)
VALENCE
ELECTRON ORBIT 2
VALENCE
ELECTRON ORBIT 1
INNER SHELL
ELECTRON ORBIT
OCCUPYING
ELECTRON

F I G. 1

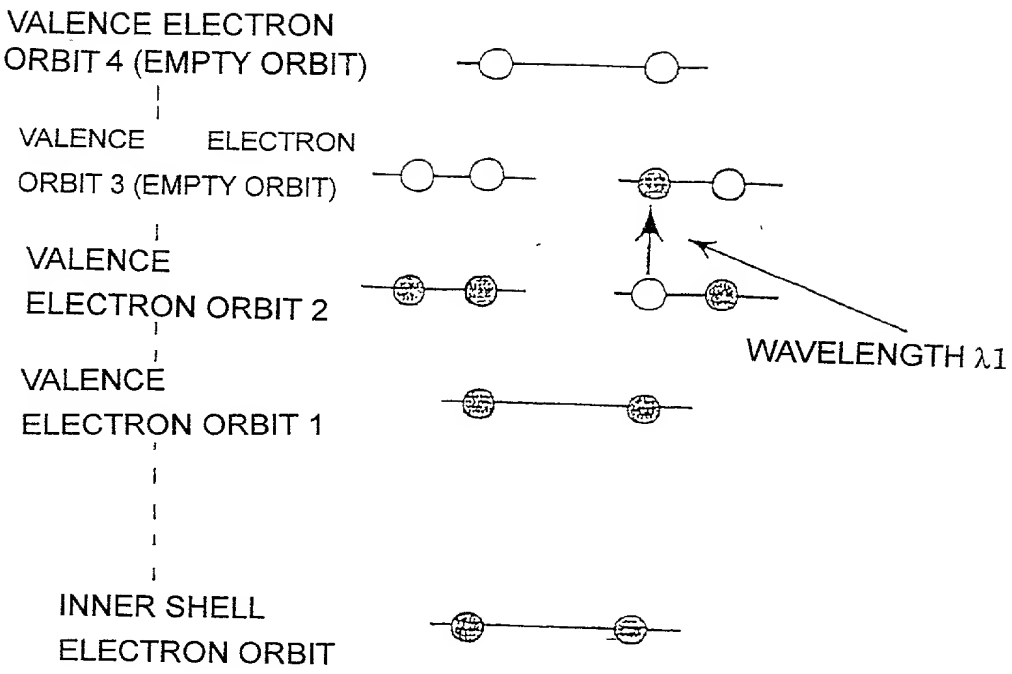

VALENCE ELECTRON
ORBIT 4 (EMPTY ORBIT)
VALENCE ELECTRON
ORBIT 3 (EMPTY ORBIT)
VALENCE
ELECTRON ORBIT 2
VALENCE
ELECTRON ORBIT 1
INNER SHELL
ELECTRON ORBIT
WAVELENGTH λ1

FIG. 2

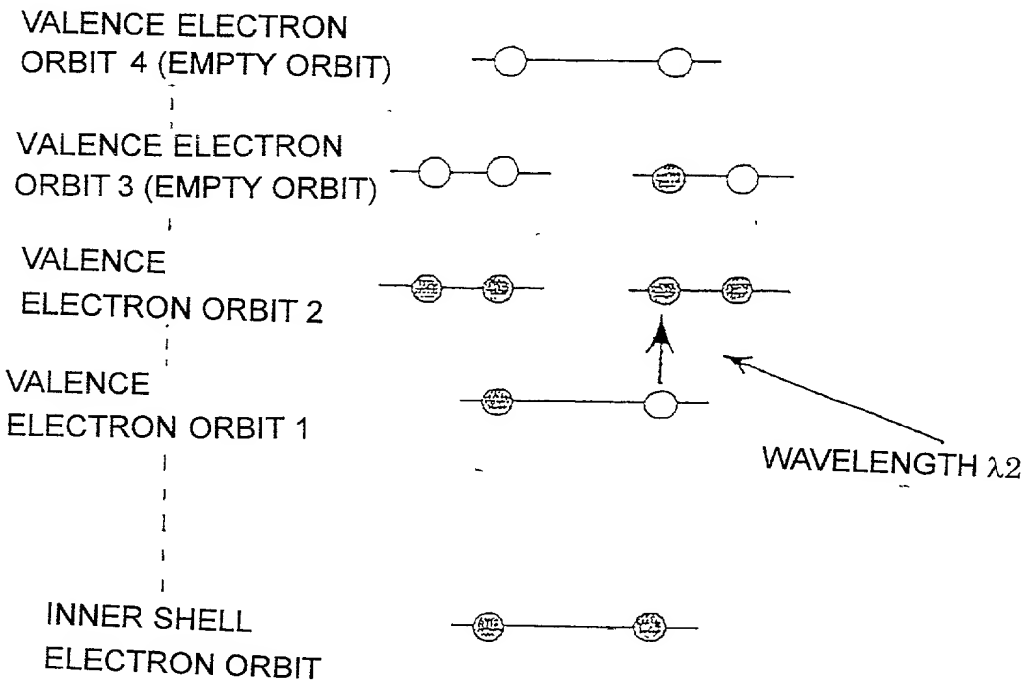

VALENCE ELECTRON
ORBIT 4 (EMPTY ORBIT)
VALENCE ELECTRON
ORBIT 3 (EMPTY ORBIT)
VALENCE
ELECTRON ORBIT 2
VALENCE
ELECTRON ORBIT 1
INNER SHELL
ELECTRON ORBIT
WAVELENGTH λ2

FIG. 3

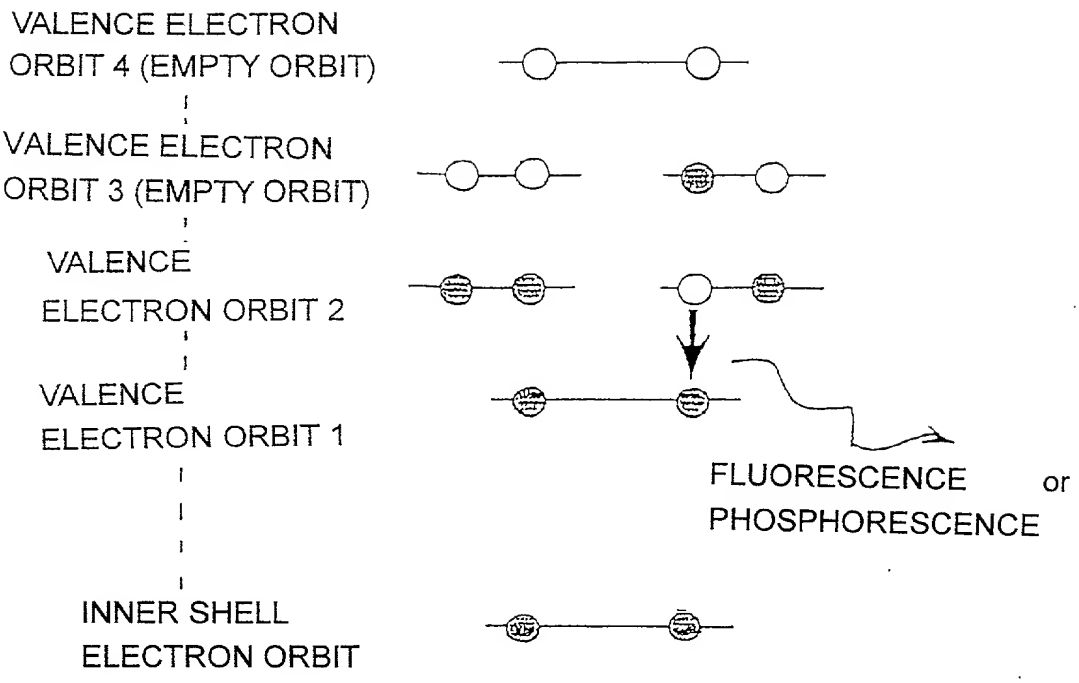

VALENCE ELECTRON
ORBIT 4 (EMPTY ORBIT)
VALENCE ELECTRON
ORBIT 3 (EMPTY ORBIT)
VALENCE
ELECTRON ORBIT 2
VALENCE
ELECTRON ORBIT 1
INNER SHELL
ELECTRON ORBIT
FLUORESCENCE
or
PHOSPHORESCENCE

FIG. 4

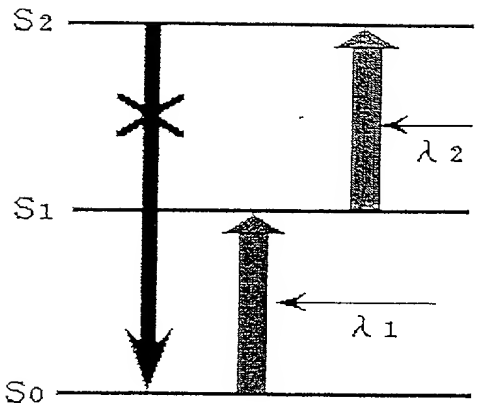


FIG. 5

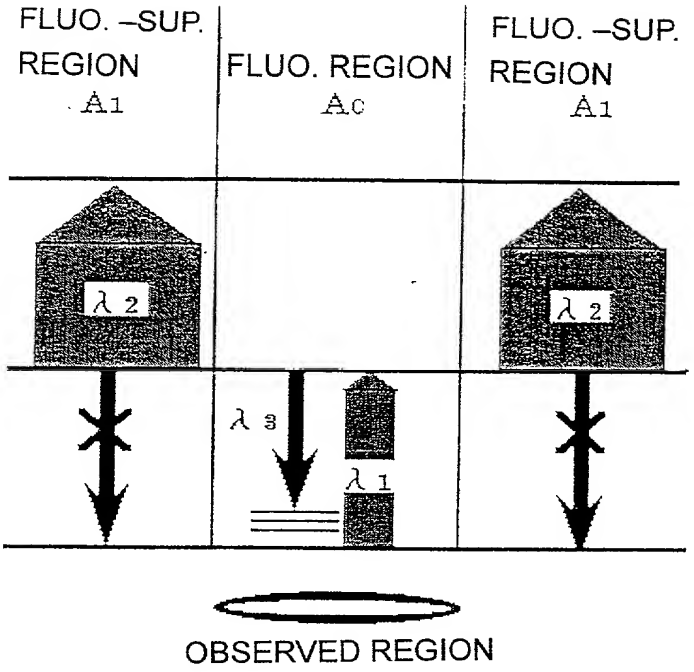

FLUO. –SUP.
REGION
A1
FLUO. REGION
Ac
FLUO. –SUP.
REGION
A1
λ 2
λ 2
λ 3
λ 1
OBSERVED REGION

FIG. 6

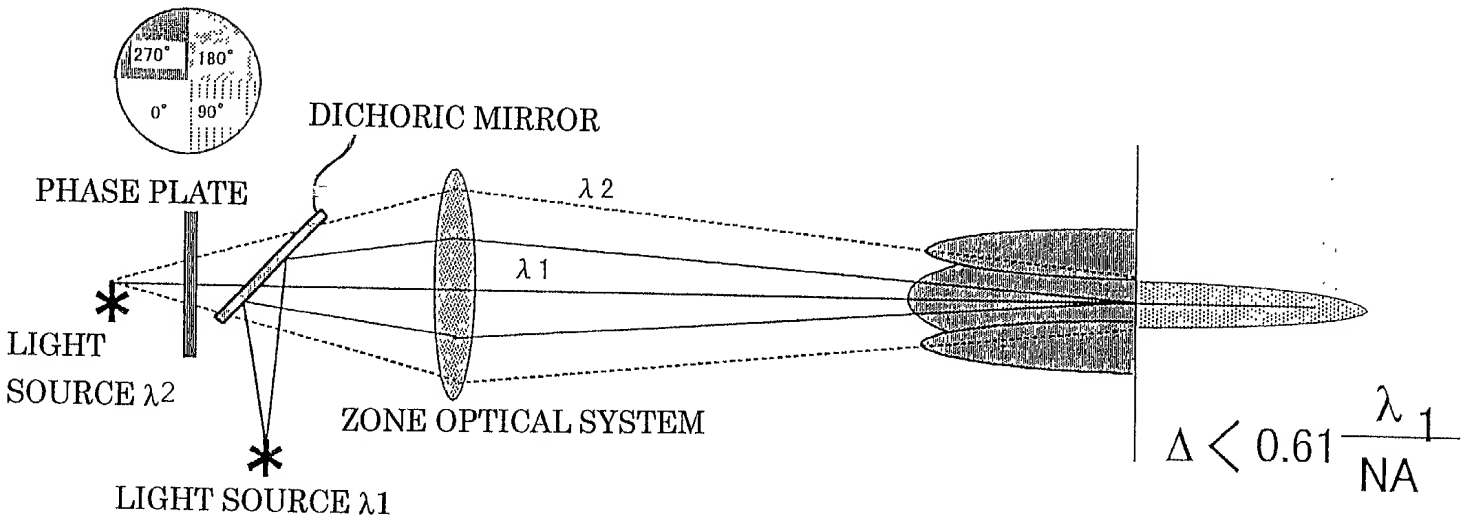

270°
180°
0°
90°
DICHORIC MIRROR
PHASE PLATE
λ2
λ1
LIGHT
SOURCE λ2
ZONE OPTICAL SYSTEM
LIGHT SOURCE λ1
$\Delta < 0.61\frac{\lambda 1}{NA}$

FIG. 7

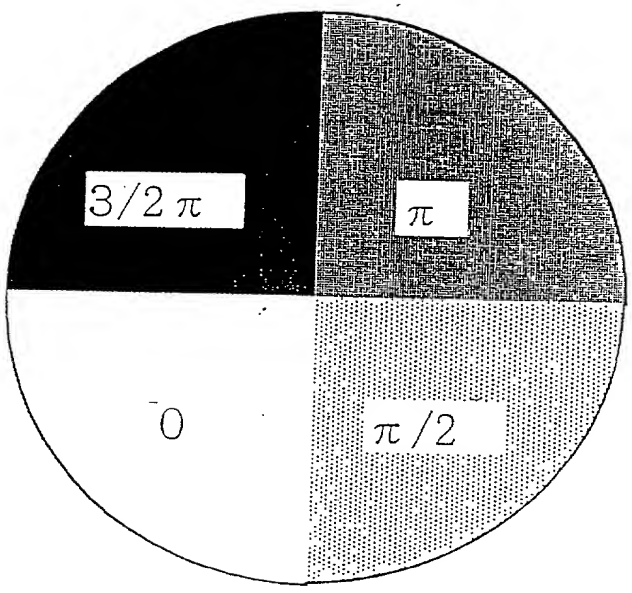


FIG. 8

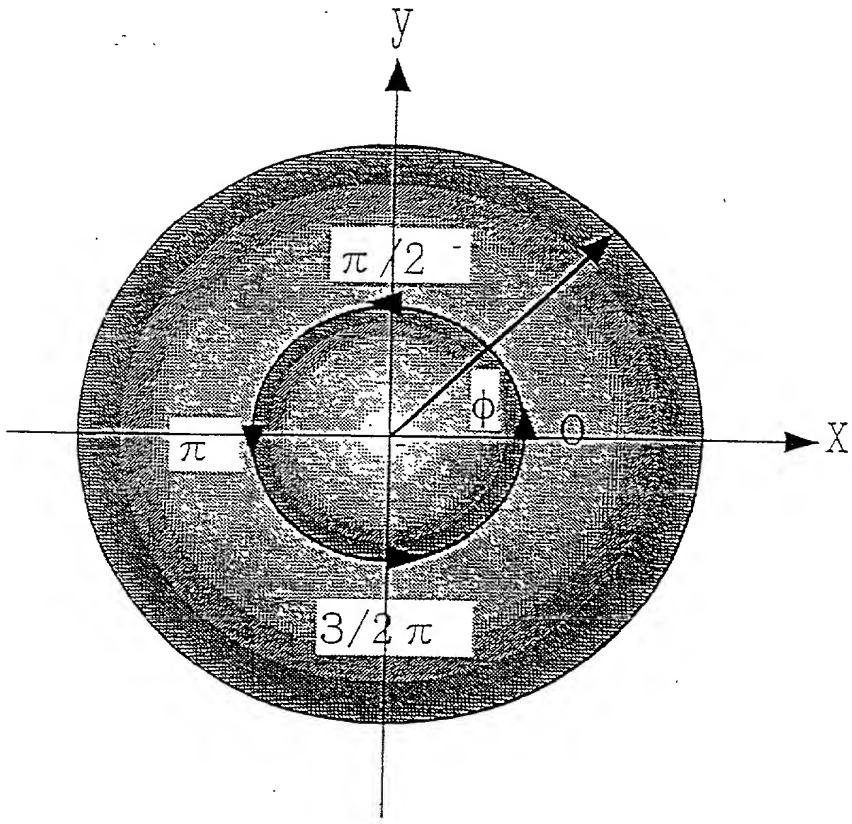


FIG. 9

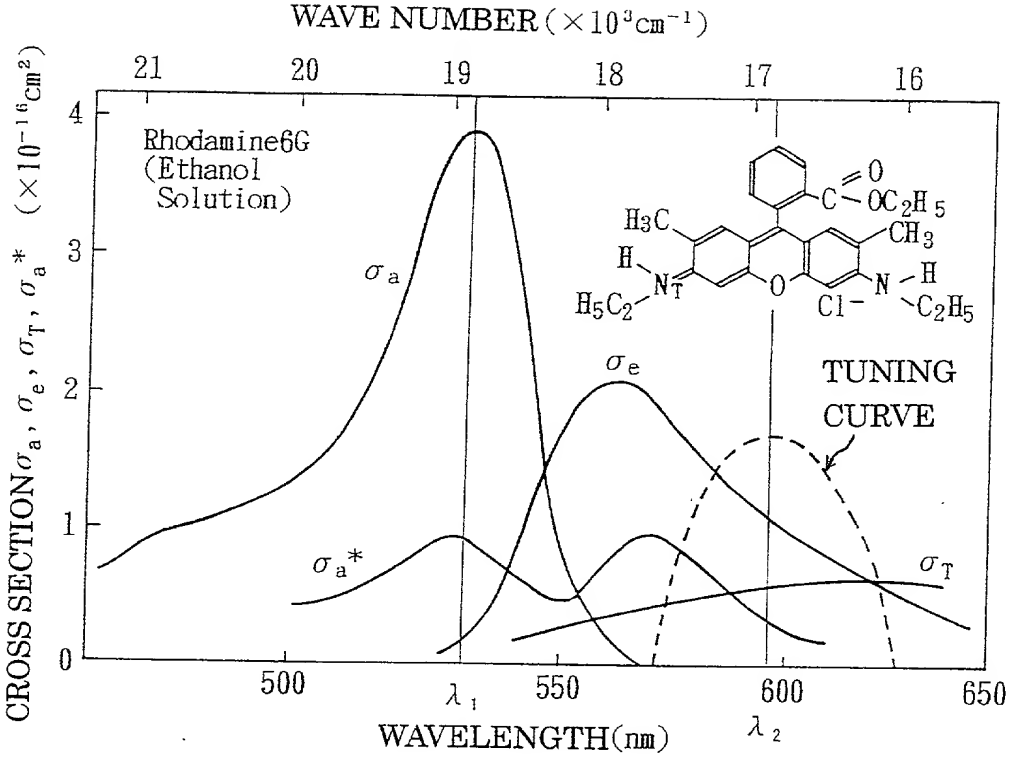

WAVE NUMBER (×10³cm⁻¹)
21
20
19
18
17
16
Rhodamine6G
(Ethanol
Solution)
σa
σe
σa*
σT
TUNING
CURVE
CROSS SECTION σa, σe, σT, σa* (×10⁻¹⁶cm²)
0
1
2
3
4
500
550
600
650
λ1
λ2
WAVELENGTH(nm)

FIG. 10

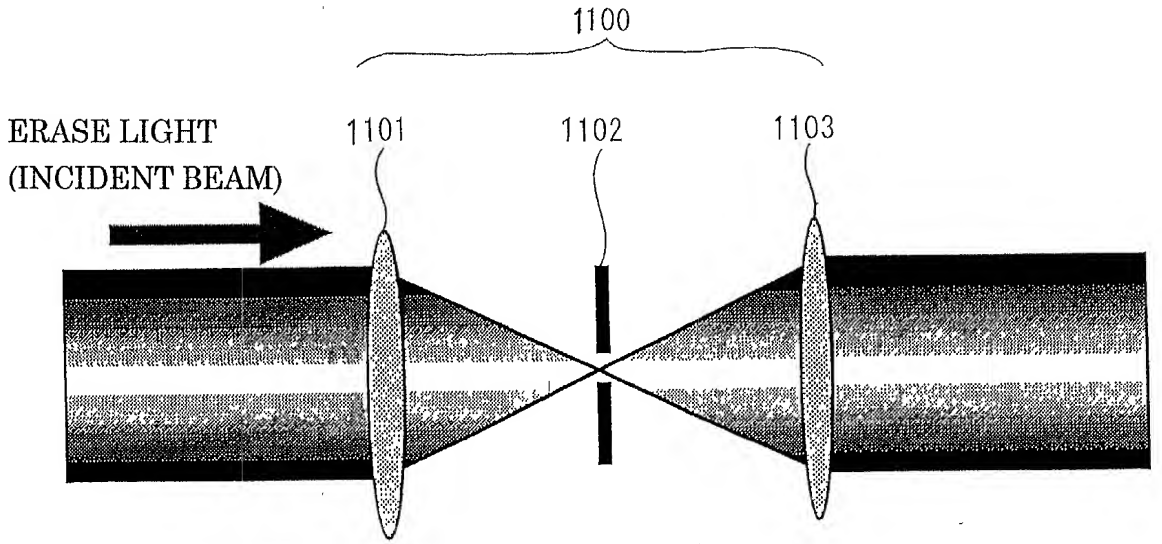


FIG. 11

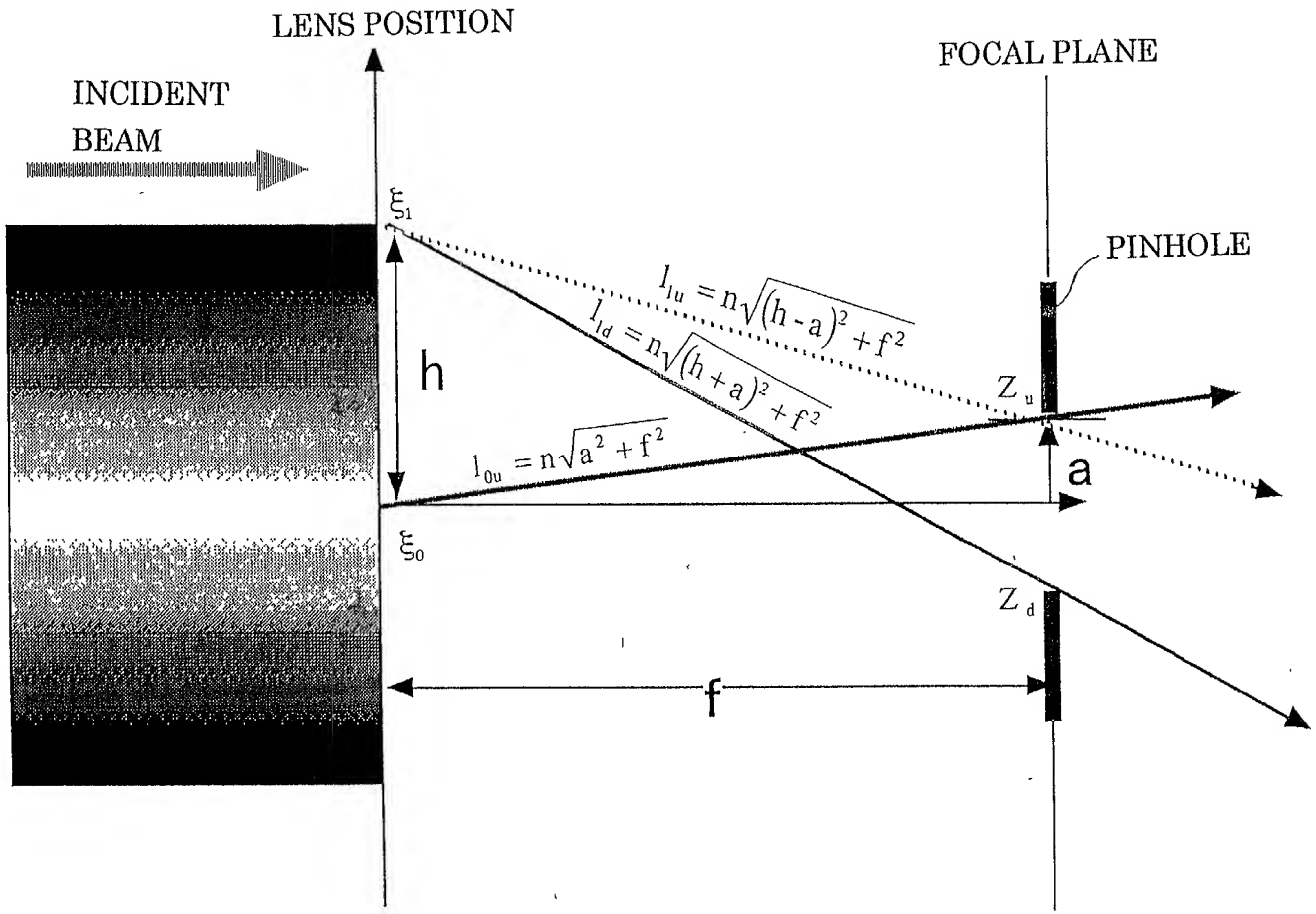
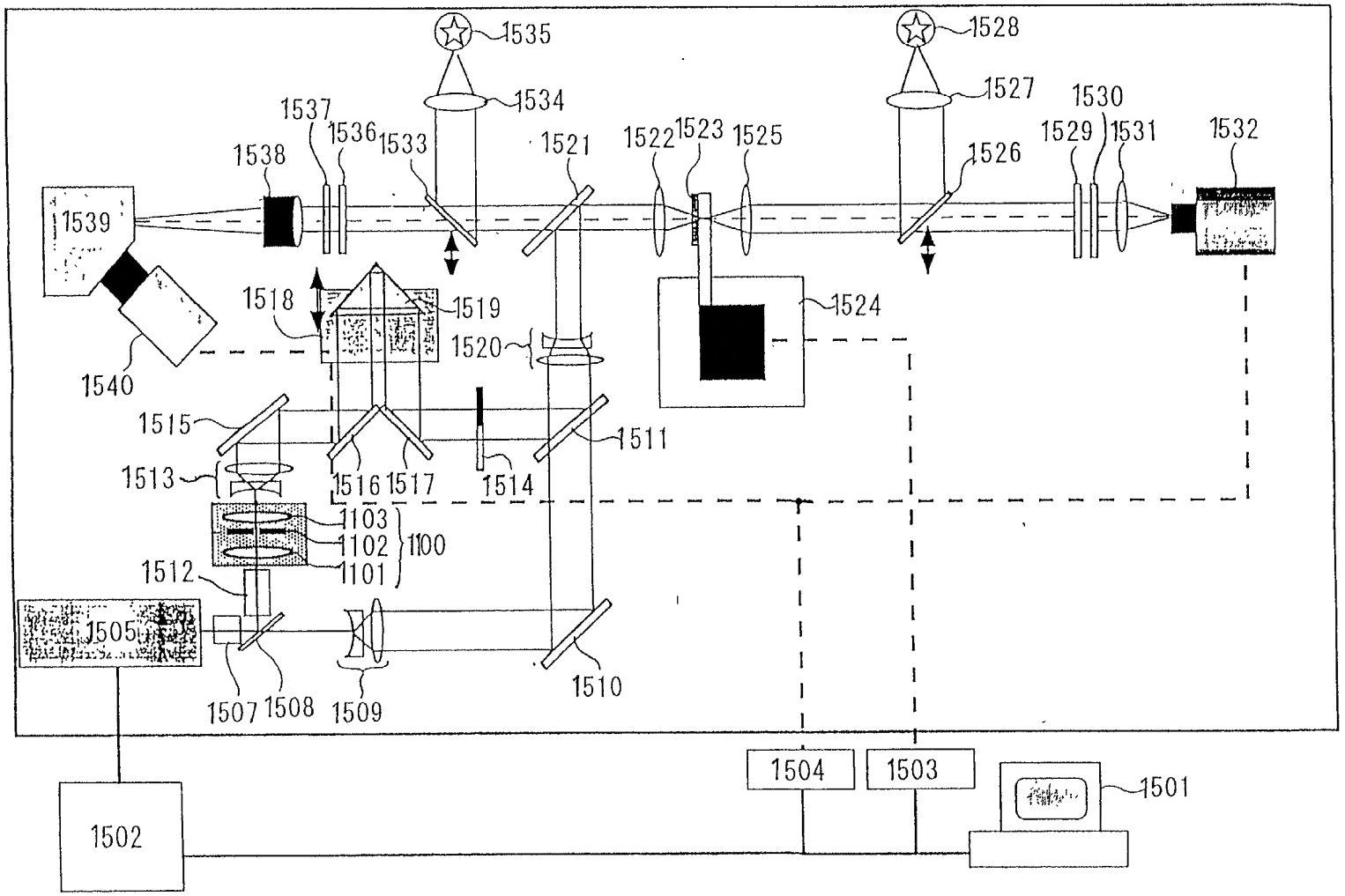


FIG. 12


1535
1528
1534
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1529
1531
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1524
1540
1515
1511
1513
1516
1517
1514
1103
1102
1100
1101
1512
1505
1507
1508
1509
1510
1504
1503
1501
1502

FIG. 13

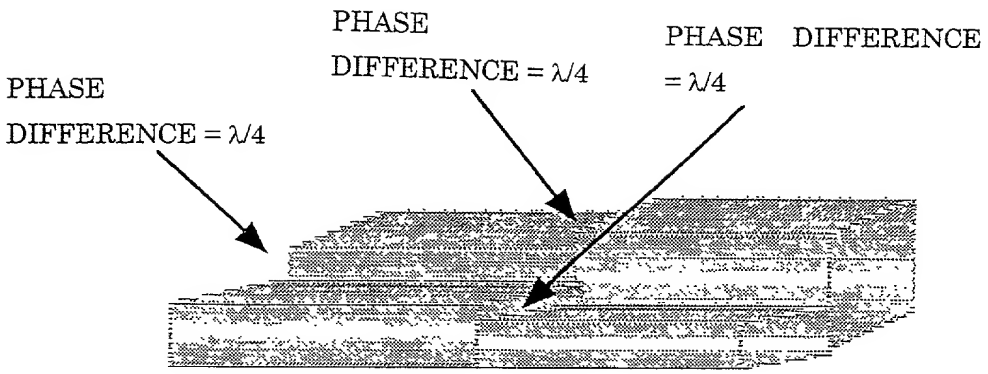

PHASE
DIFFERENCE = λ/4
PHASE DIFFERENCE
= λ/4
PHASE
DIFFERENCE = λ/4

FIG. 14

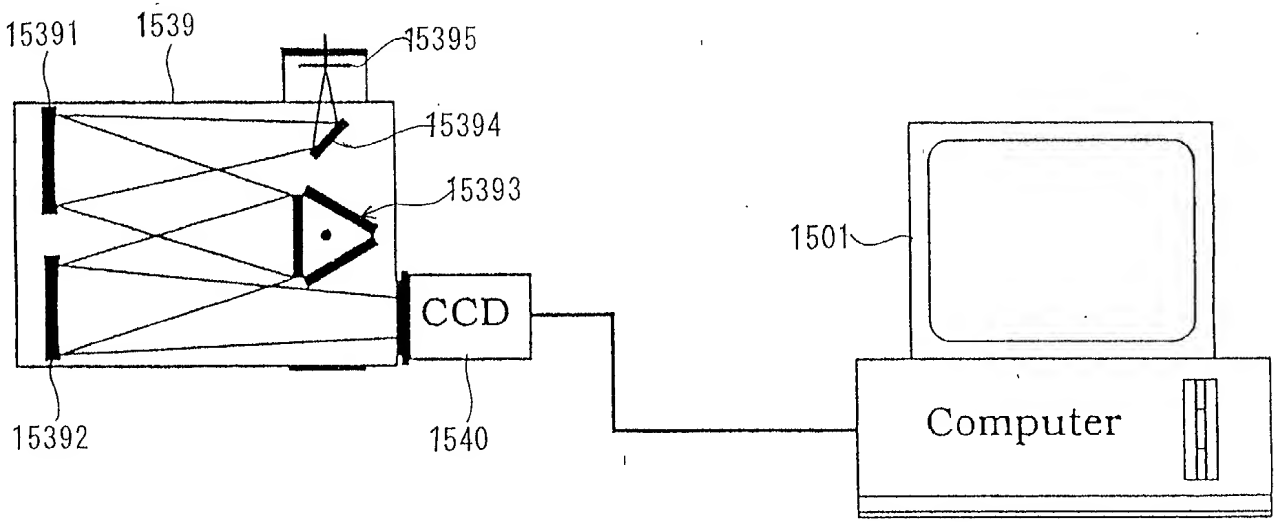


FIG. 15

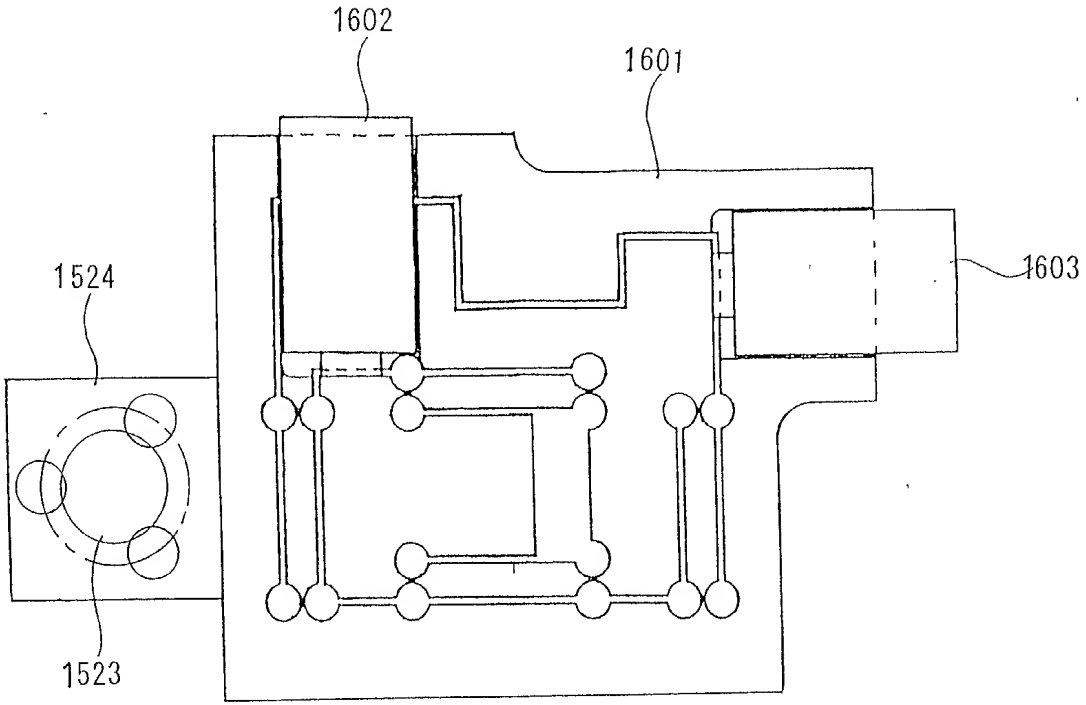


FIG. 16

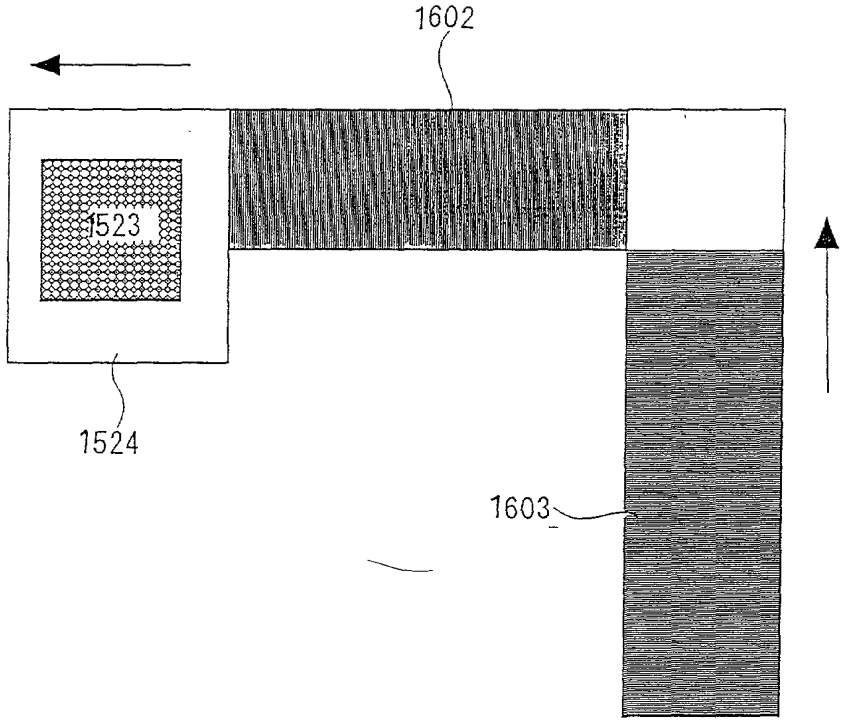
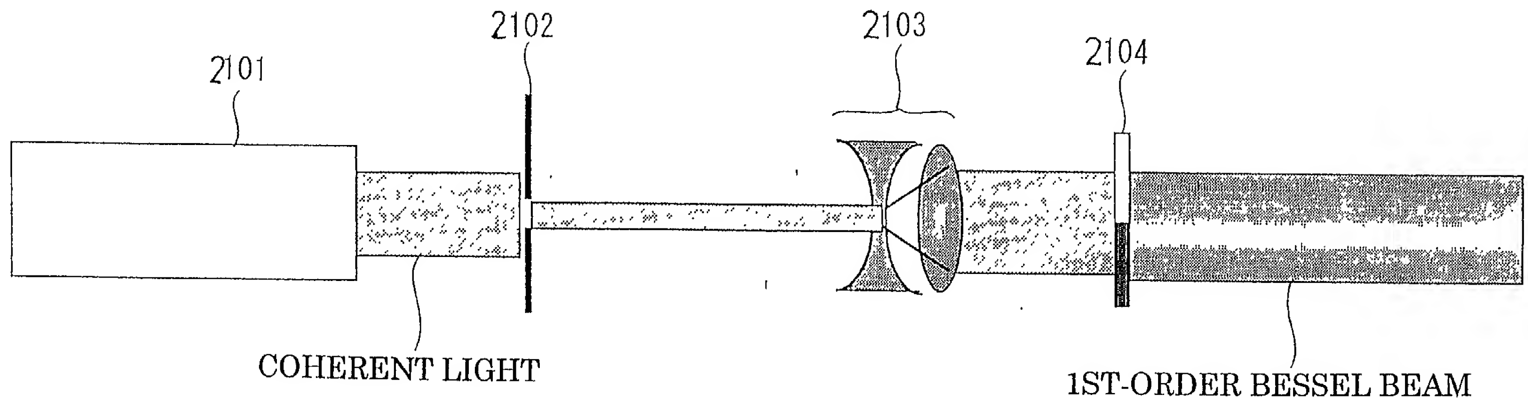


FIG. 17



F I G. 1 8

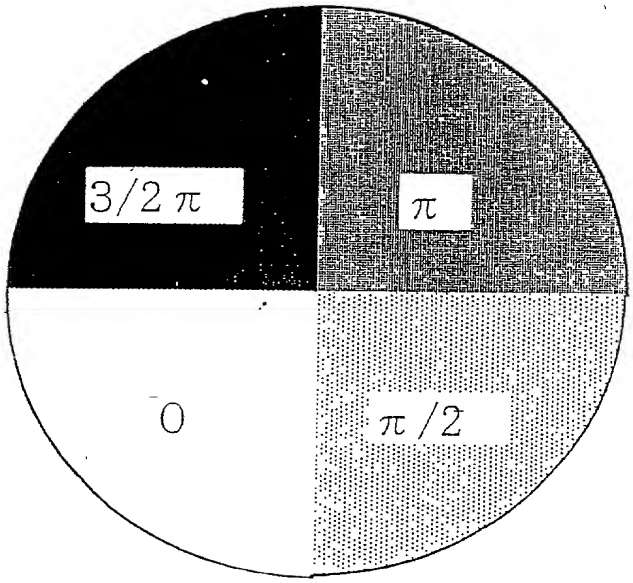


FIG. 19

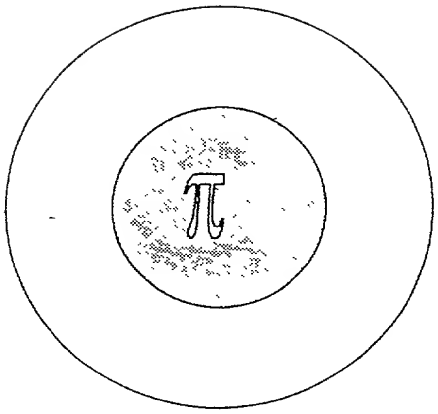


FIG. 20

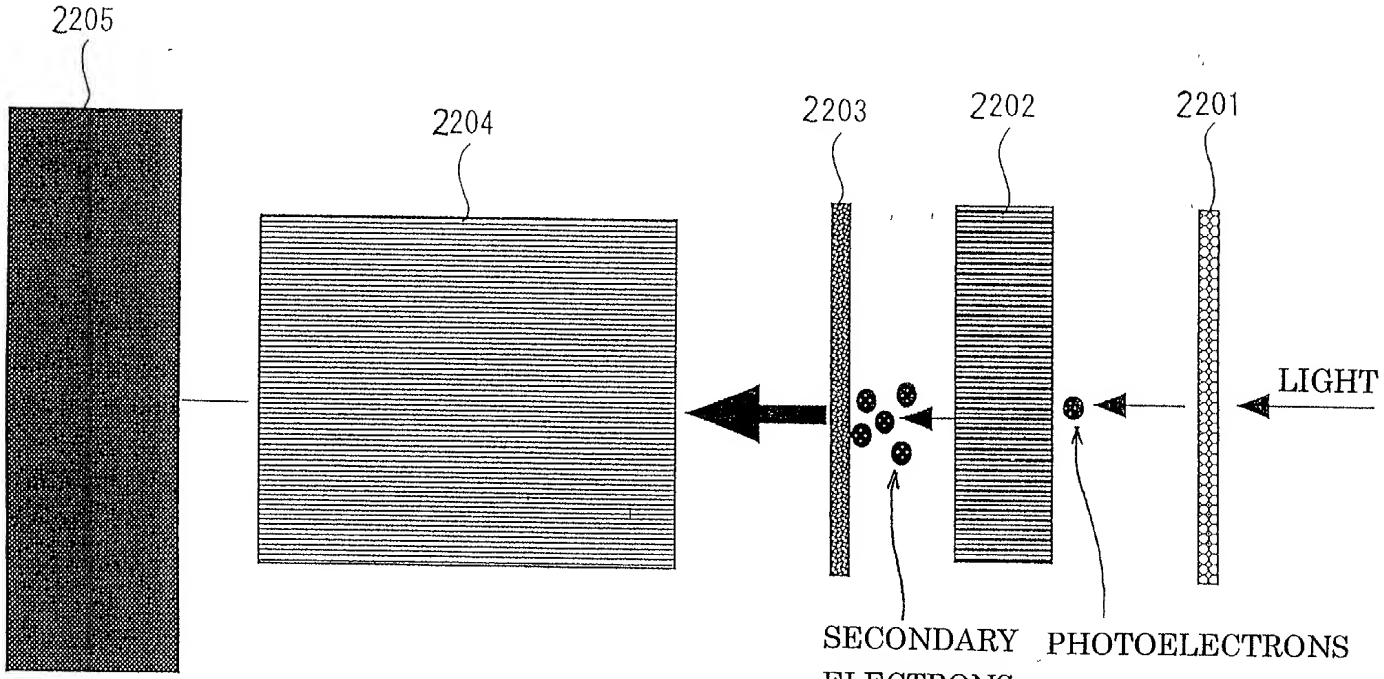

2205
2204
2203
2202
2201
LIGHT
SECONDARY ELECTRONS
PHOTOELECTRONS

FIG. 21

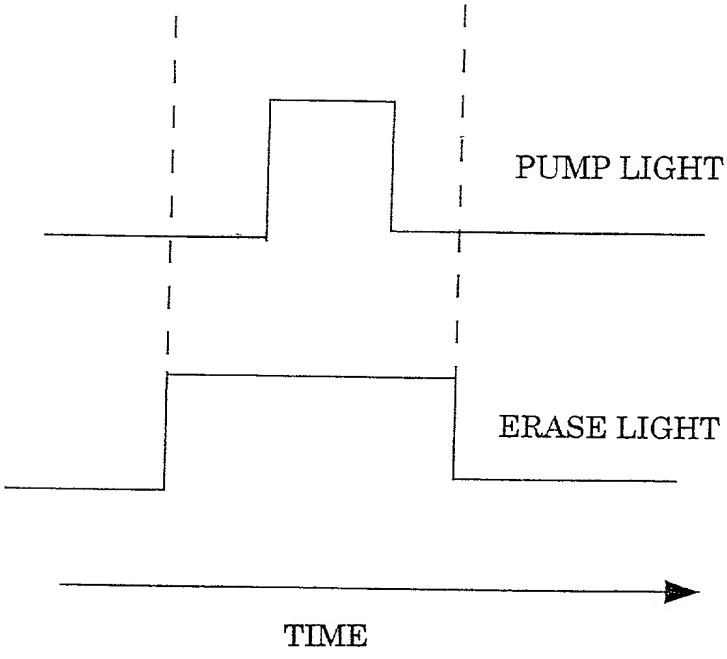


FIG. 22

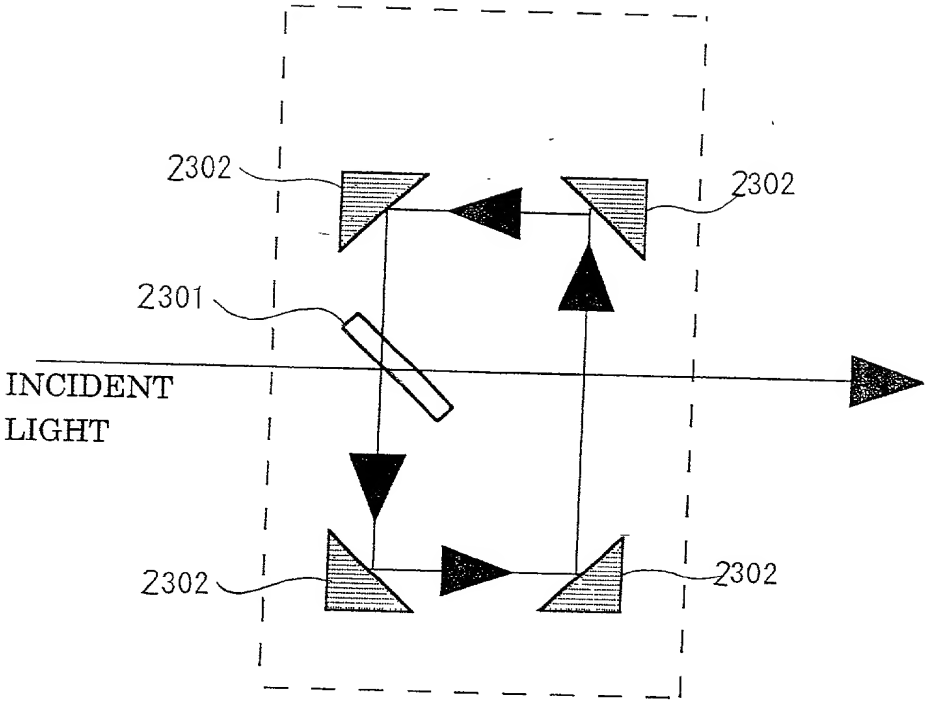
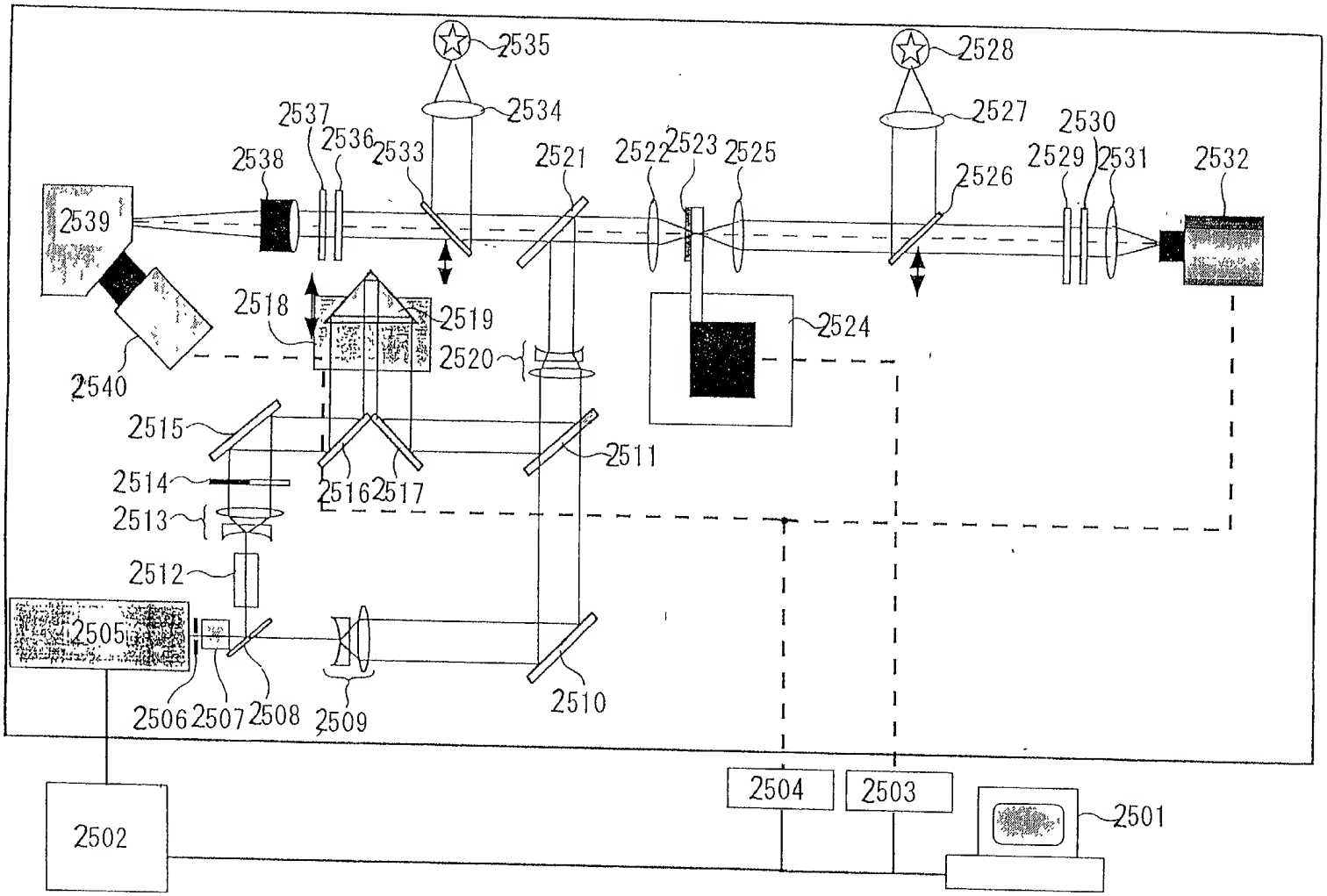


FIG. 23


2535
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2517
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2512
2505
2506
2507
2508
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2510
2504
2503
2501
2502

FIG. 24

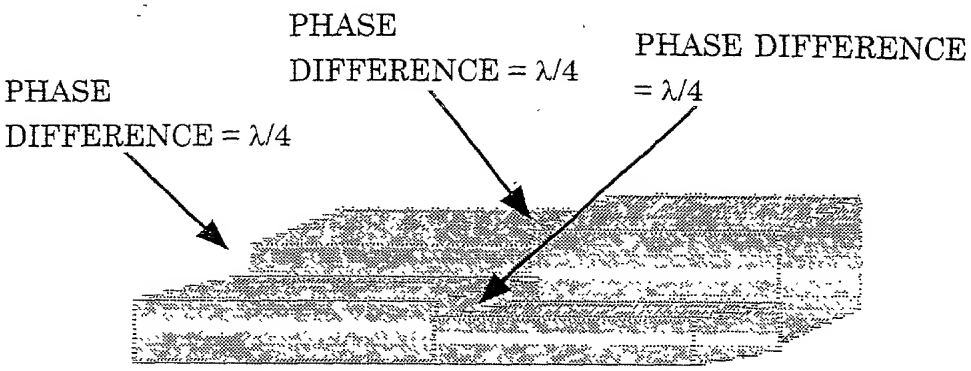

PHASE
DIFFERENCE = λ/4
PHASE DIFFERENCE
= λ/4
PHASE
DIFFERENCE = λ/4

FIG. 25

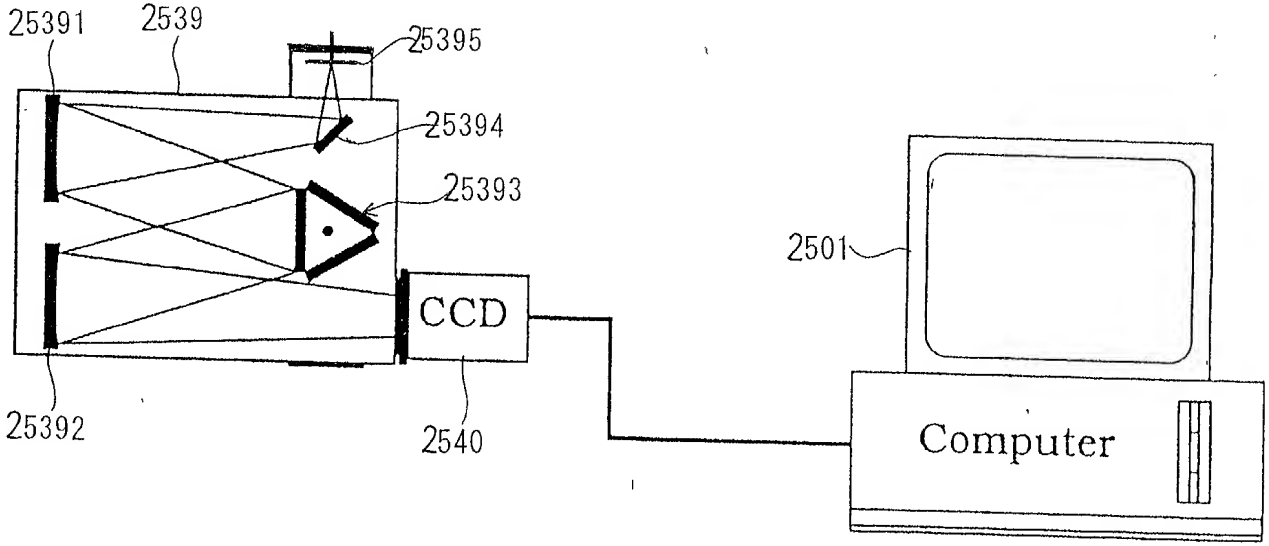


FIG. 26

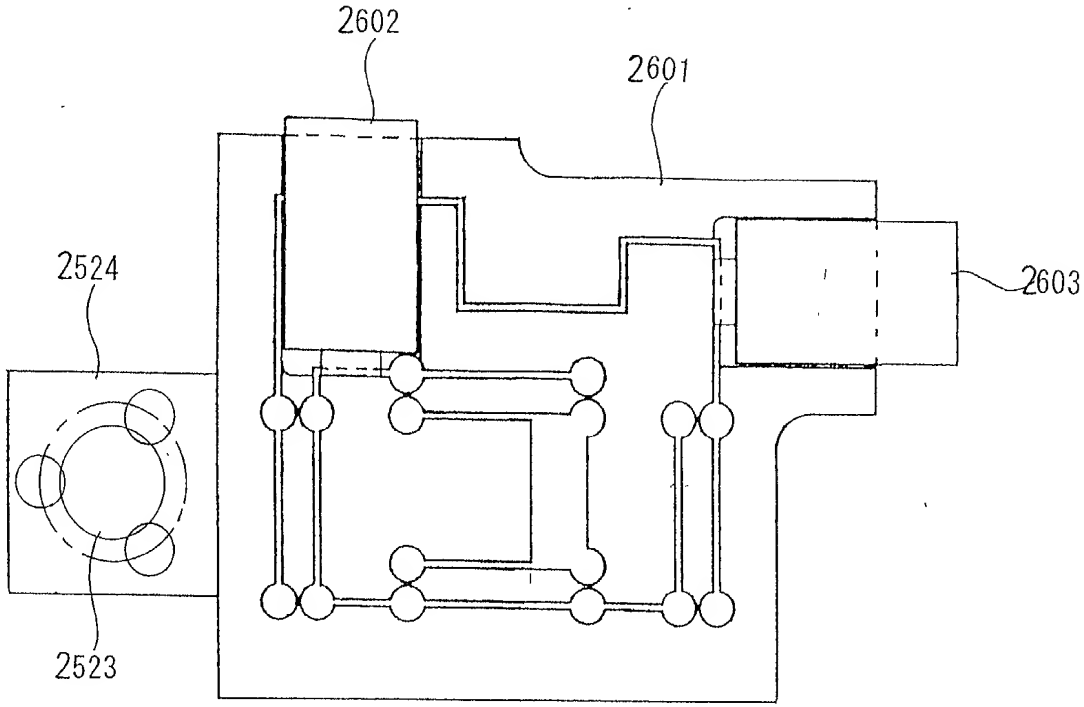


FIG. 27

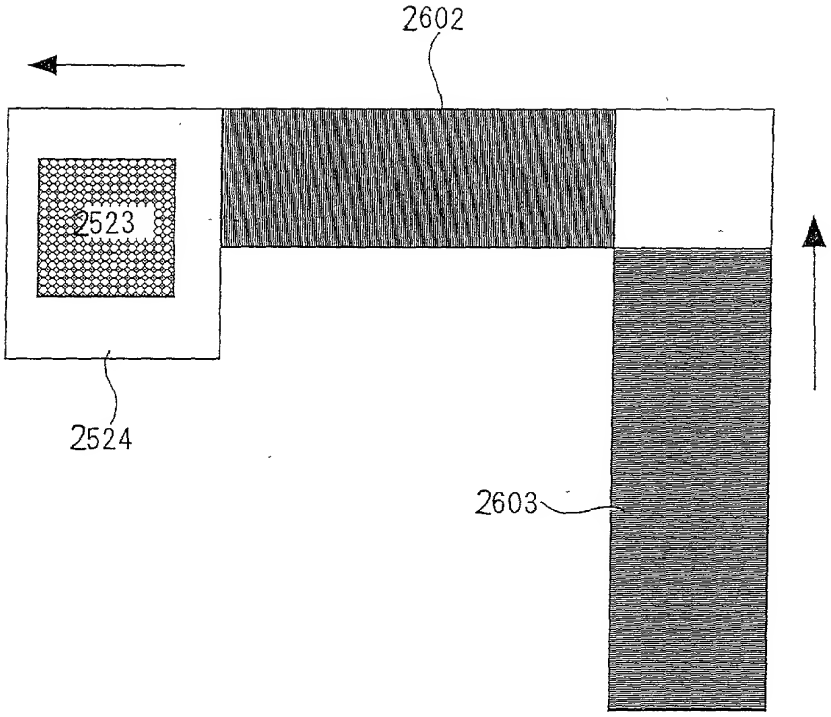


FIG. 28

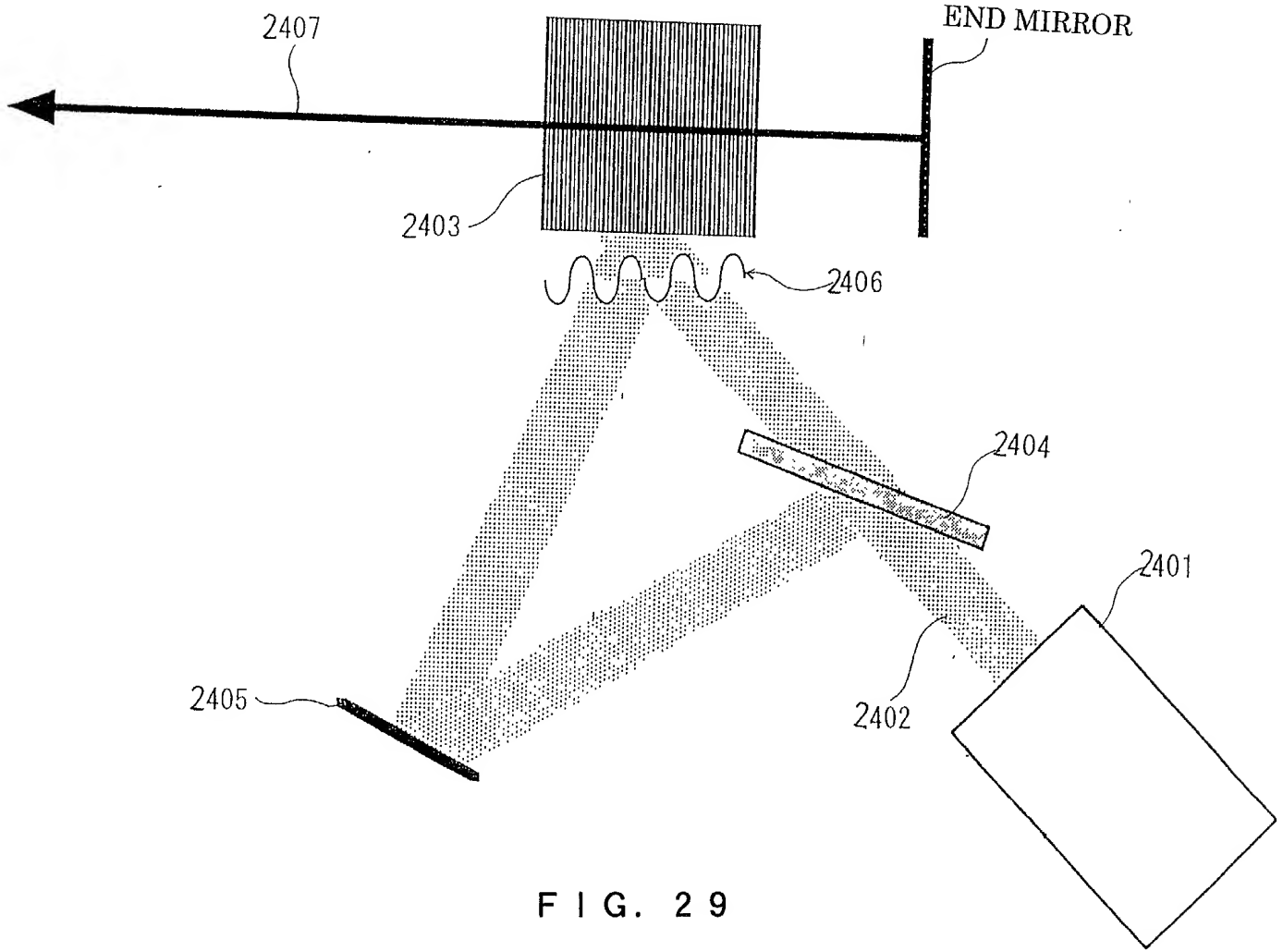


FIG. 29

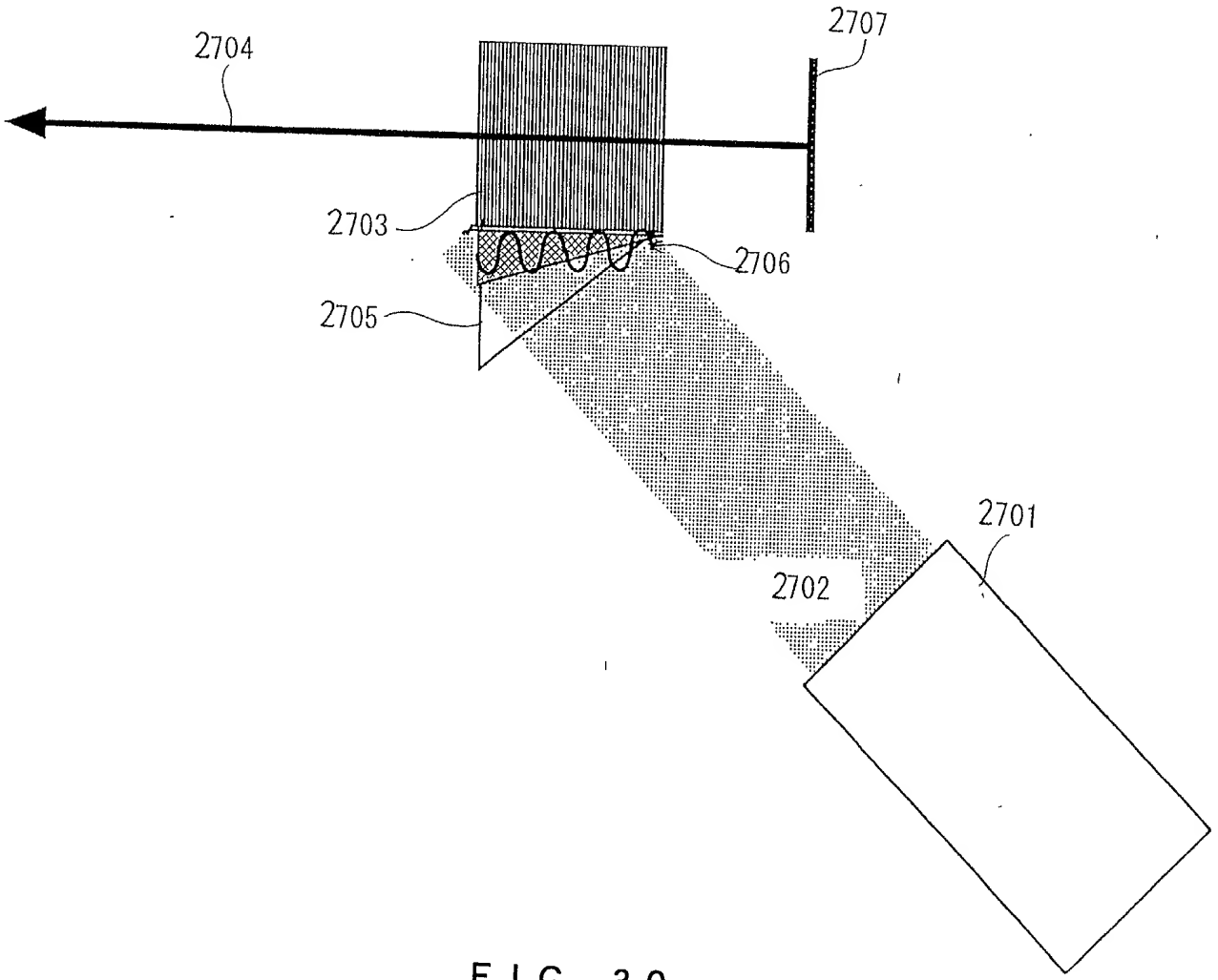


FIG. 30

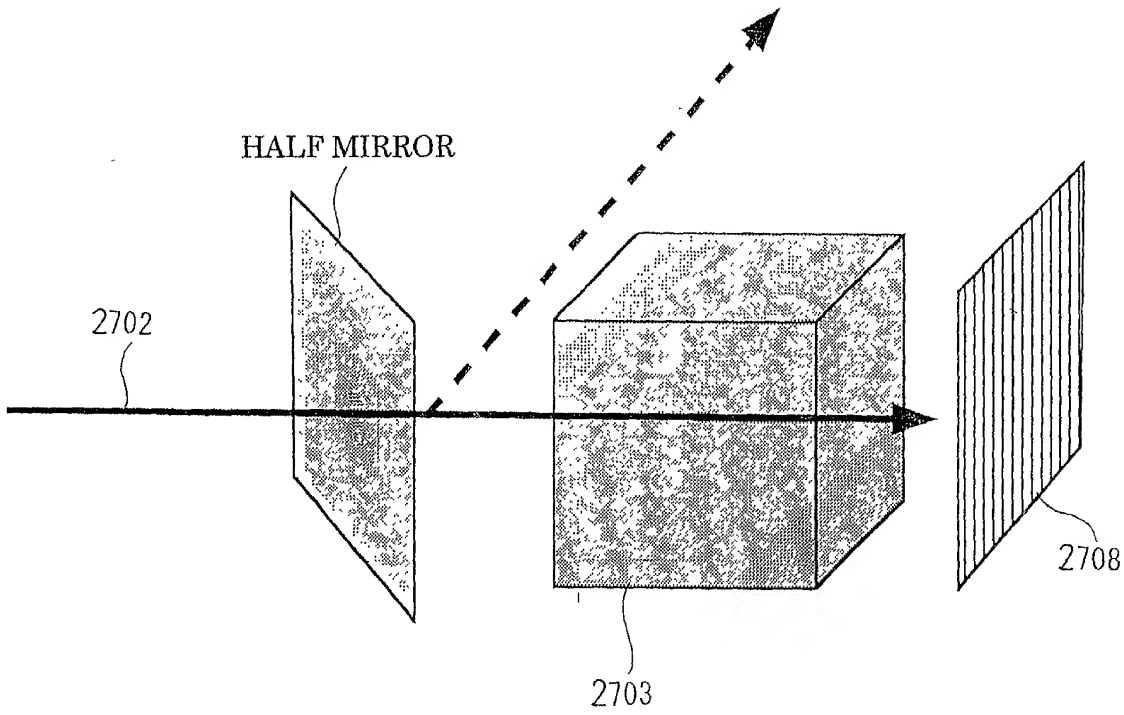


FIG. 31

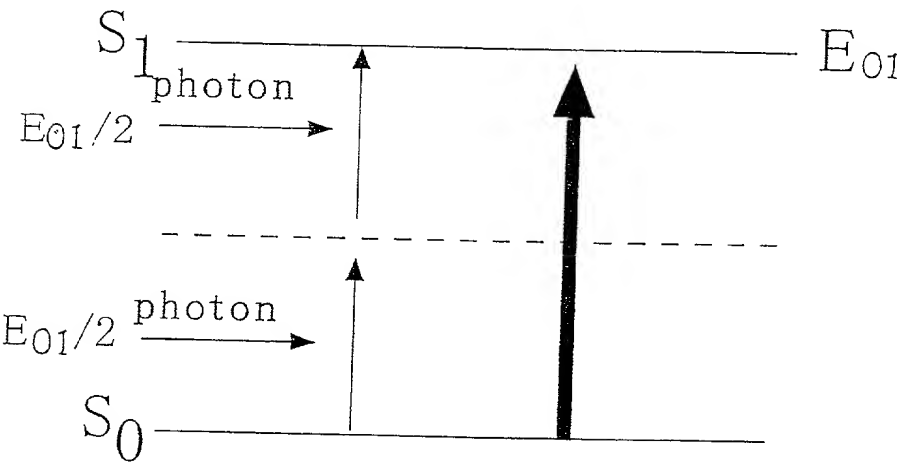


FIG. 32

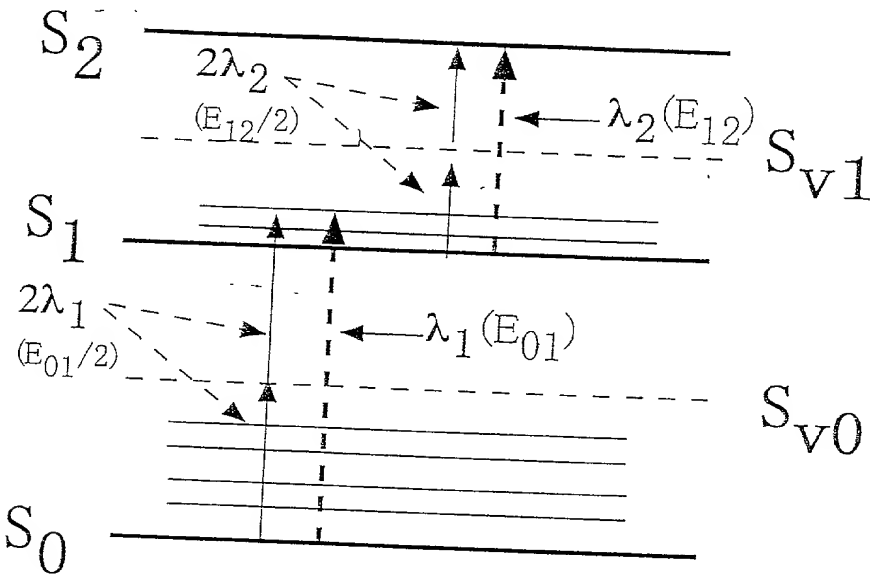

S_2
$2\lambda_2$
$(E_{12}/2)$
$\lambda_2(E_{12})$
S_{v1}
S_1
$2\lambda_1$
$(E_{01}/2)$
$\lambda_1(E_{01})$
S_{v0}
S_0

FIG. 33

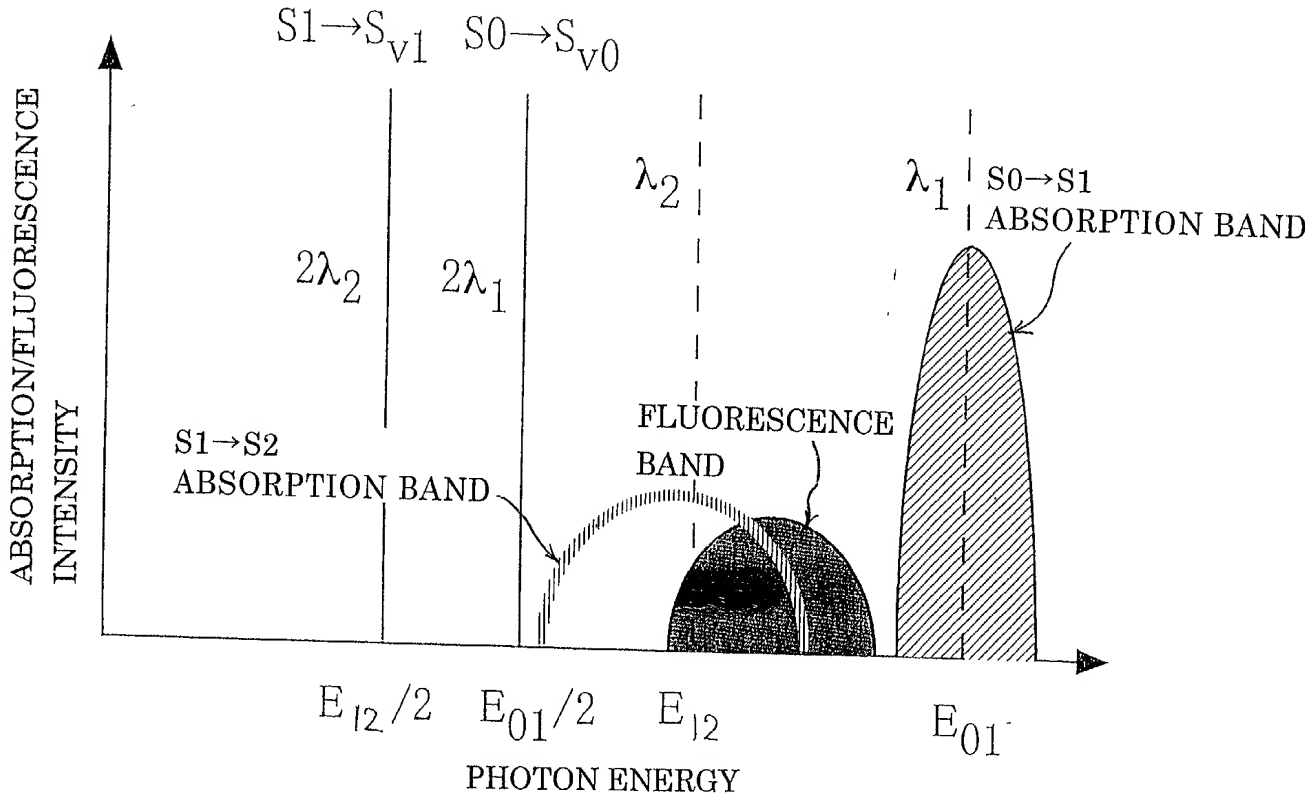
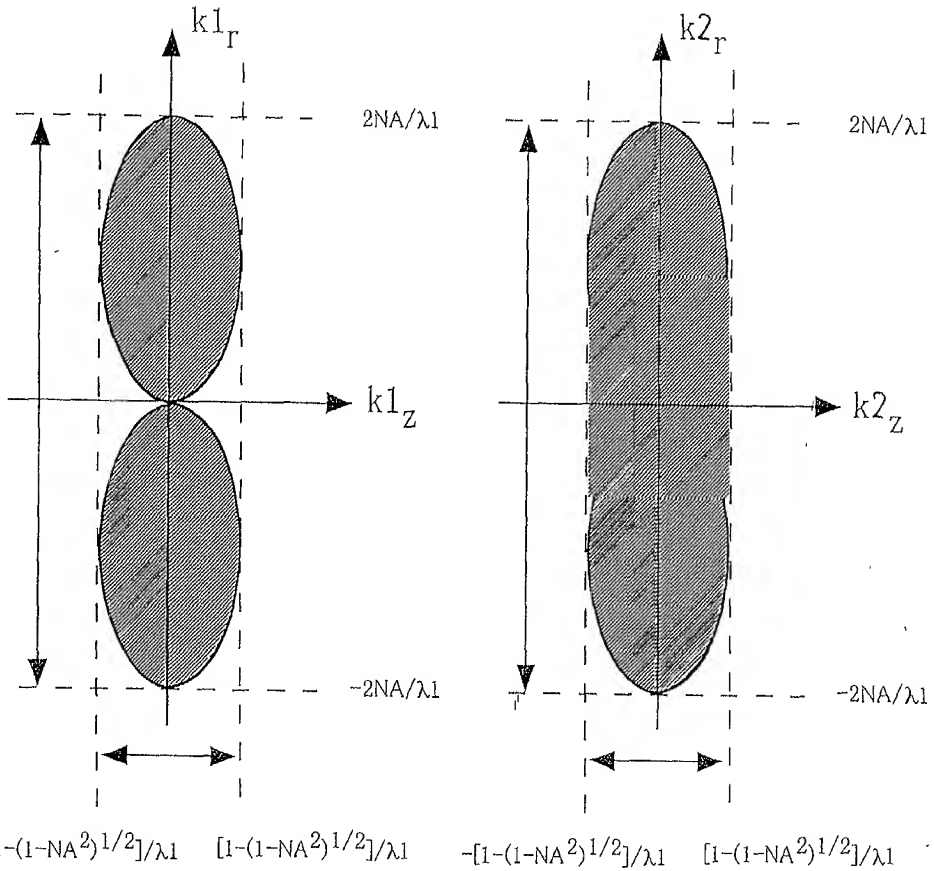
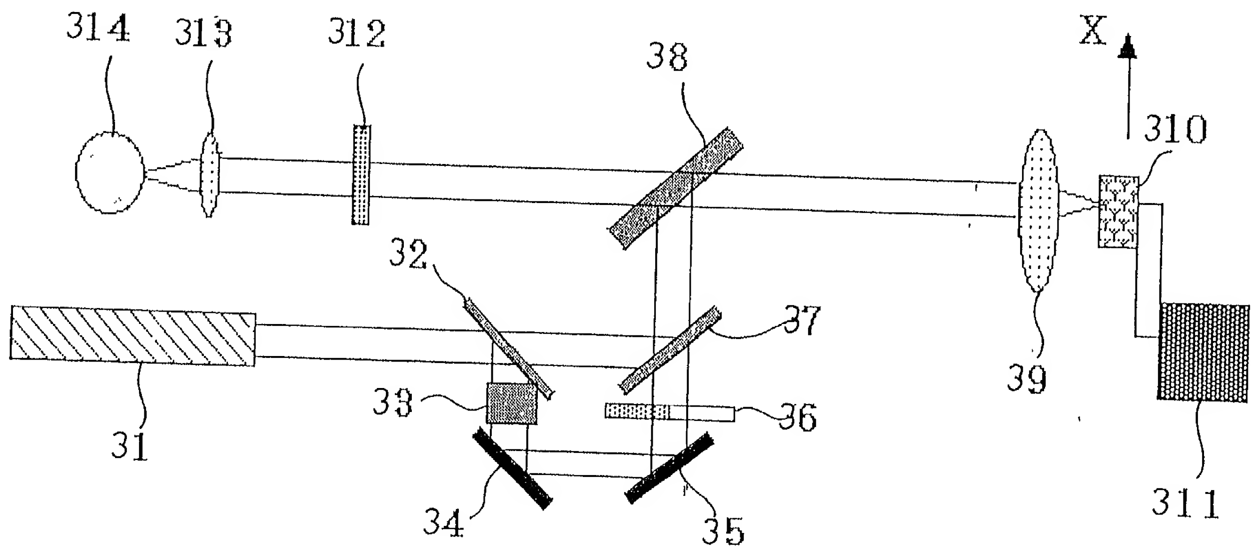


FIG. 34



(a) 1-PHOTON EXCITATION PROCESS (b) NON-RESONANCE 2-PHOTON EXCITATION PROCESS

FIG. 35



F I G. 3 6

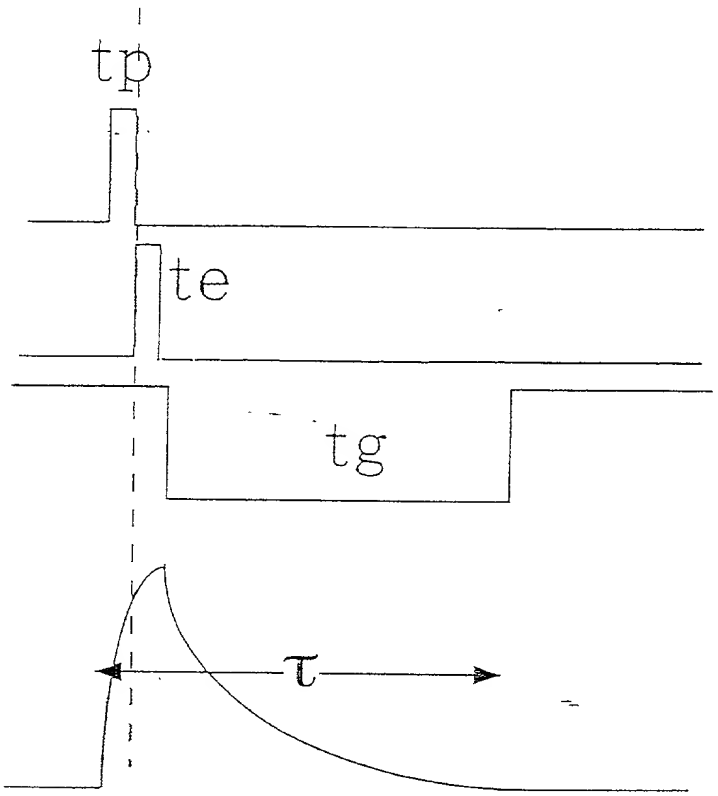


FIG. 37

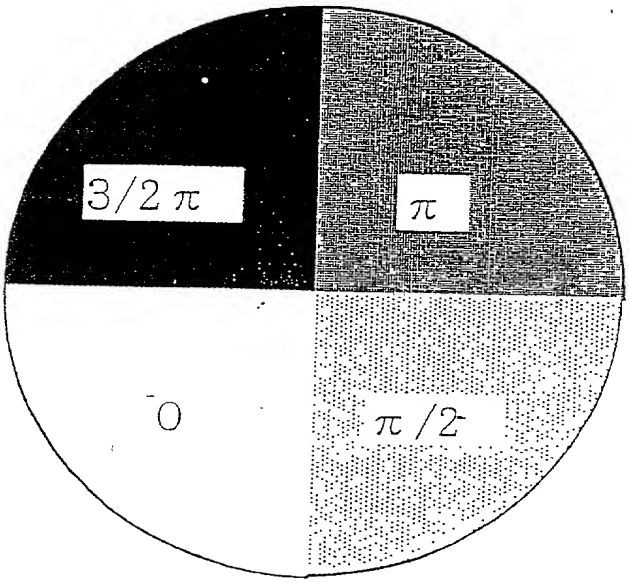


FIG. 38

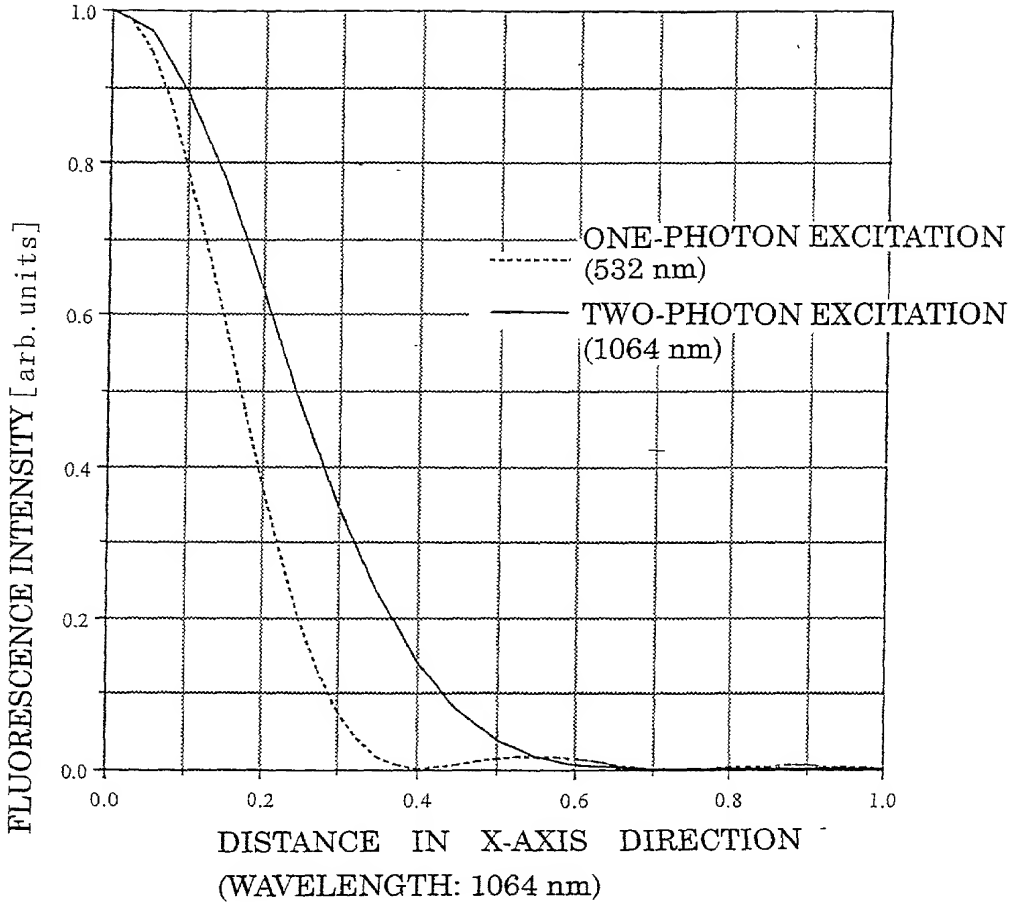

1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
FLUORESCENCE INTENSITY [arb. units]
ONE-PHOTON EXCITATION
(532 nm)
TWO-PHOTON EXCITATION
(1064 nm)
DISTANCE IN X-AXIS DIRECTION
(WAVELENGTH: 1064 nm)

FIG. 39

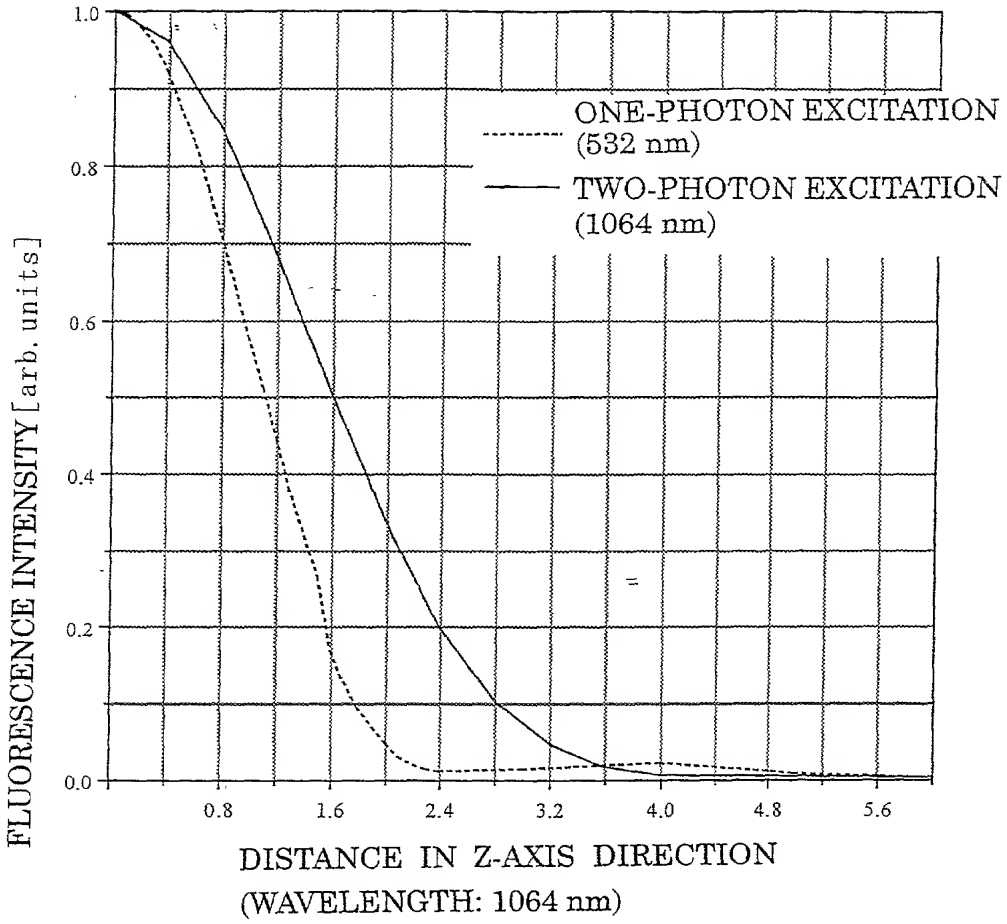

1.0
0.8
0.6
0.4
0.2
0.0
0.8
1.6
2.4
3.2
4.0
4.8
5.6
ONE-PHOTON EXCITATION
(532 nm)
TWO-PHOTON EXCITATION
(1064 nm)
FLUORESCENCE INTENSITY [arb. units]
DISTANCE IN Z-AXIS DIRECTION
(WAVELENGTH: 1064 nm)

FIG. 40

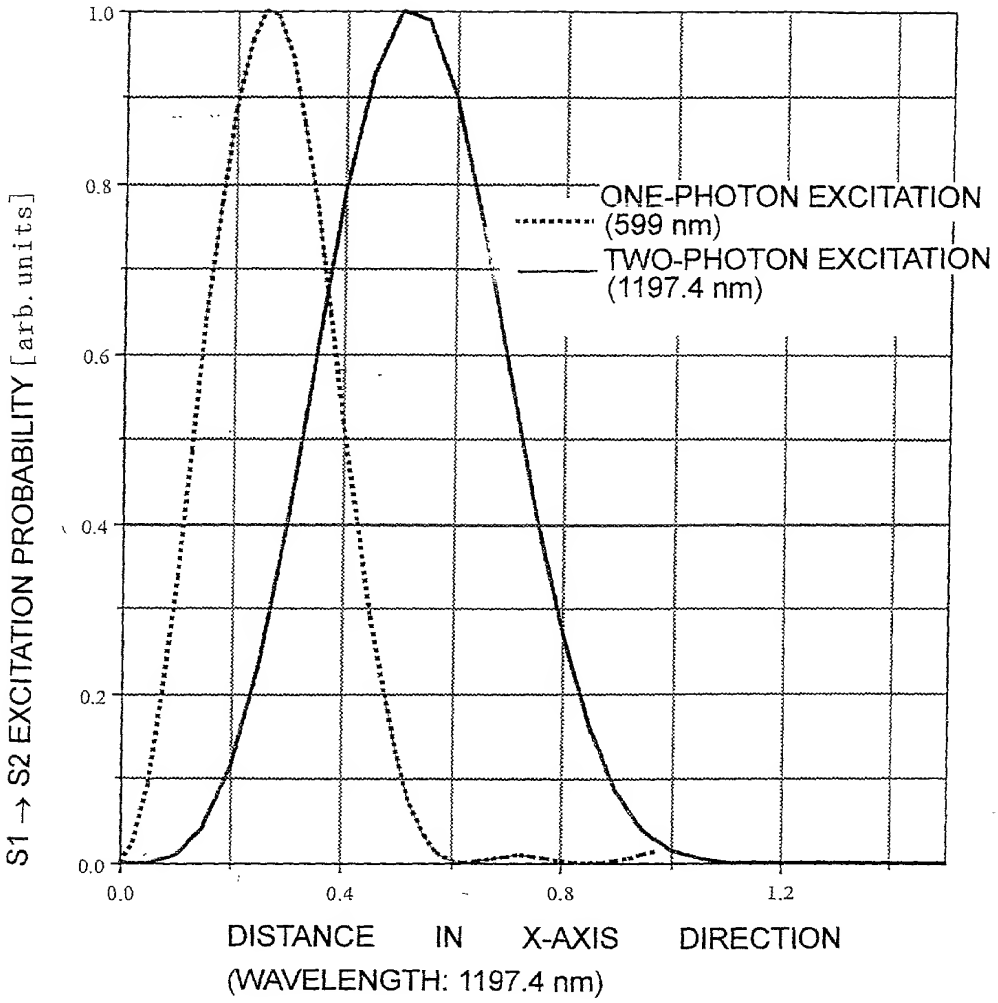

1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.4
0.8
1.2
S1 → S2 EXCITATION PROBABILITY [arb. units]
ONE-PHOTON EXCITATION
(599 nm)
TWO-PHOTON EXCITATION
(1197.4 nm)
DISTANCE IN X-AXIS DIRECTION
(WAVELENGTH: 1197.4 nm)

FIG. 41

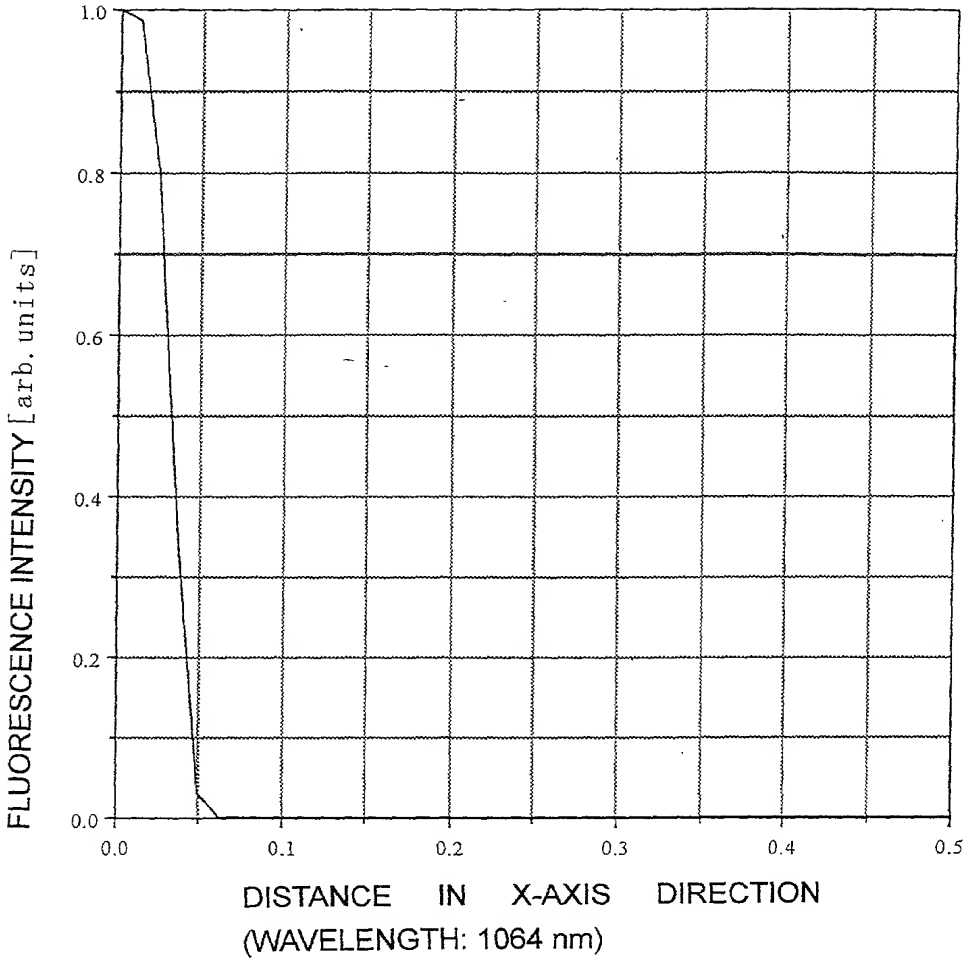

1.0
0.8
0.6
0.4
0.2
0.0
FLUORESCENCE INTENSITY [arb. units]
0.0
0.1
0.2
0.3
0.4
0.5
DISTANCE IN X-AXIS DIRECTION
(WAVELENGTH: 1064 nm)

FIG. 42

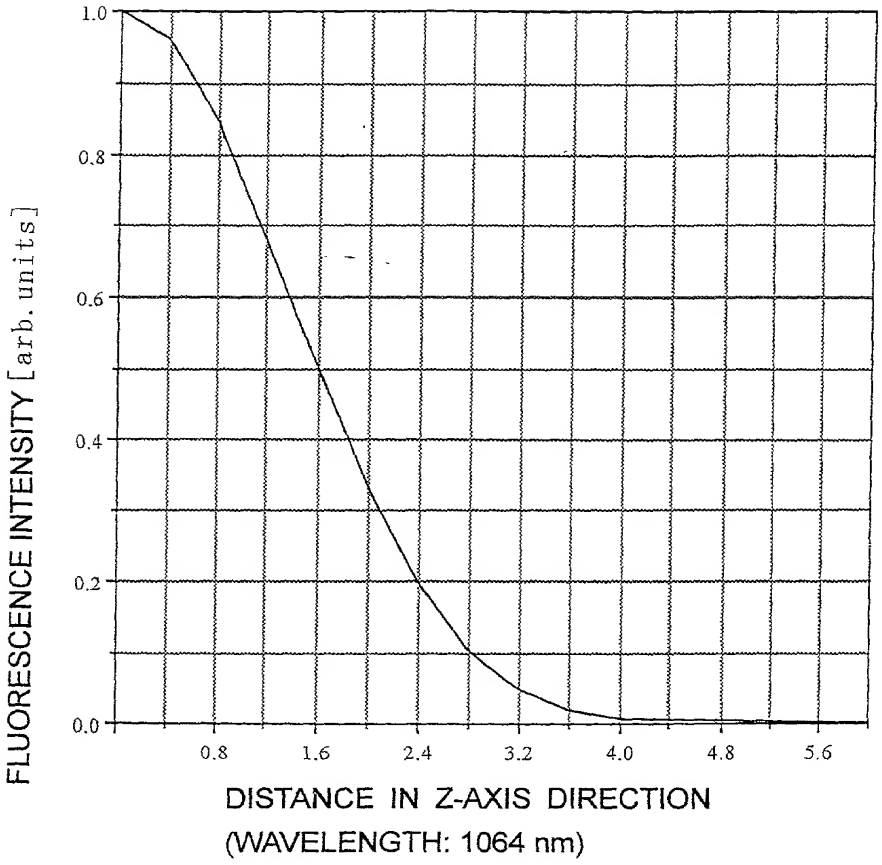

FLUORESCENCE INTENSITY [arb. units]
1.0
0.8
0.6
0.4
0.2
0.0
0.8
1.6
2.4
3.2
4.0
4.8
5.6
DISTANCE IN Z-AXIS DIRECTION
(WAVELENGTH: 1064 nm)

FIG. 43

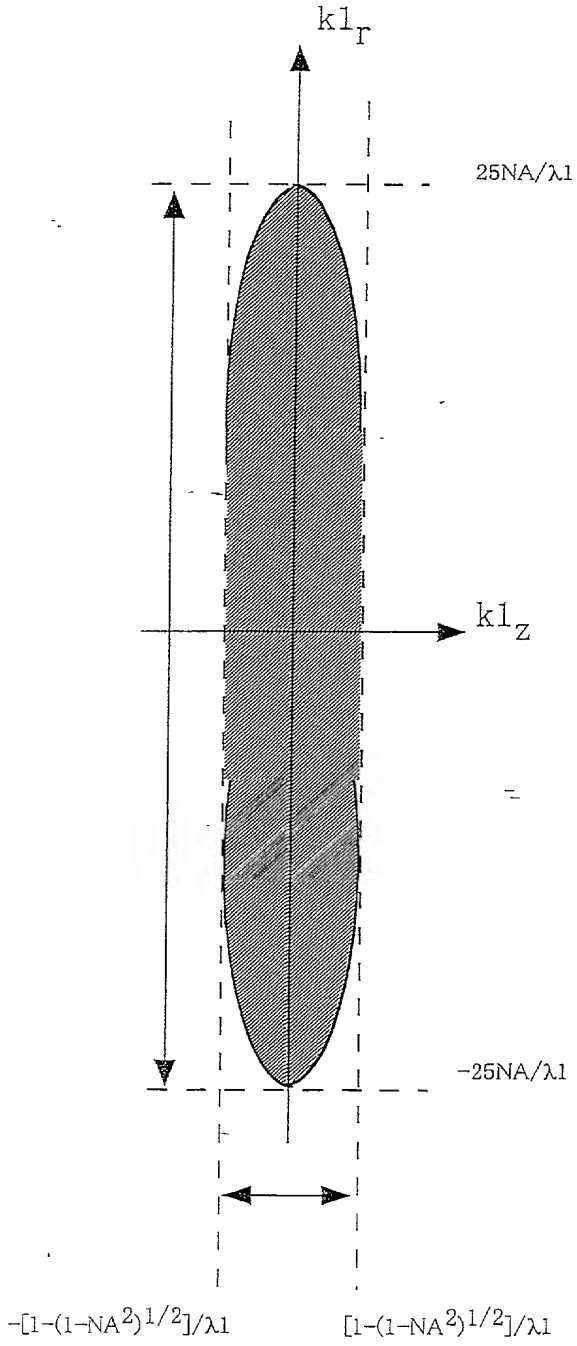


FIG. 44

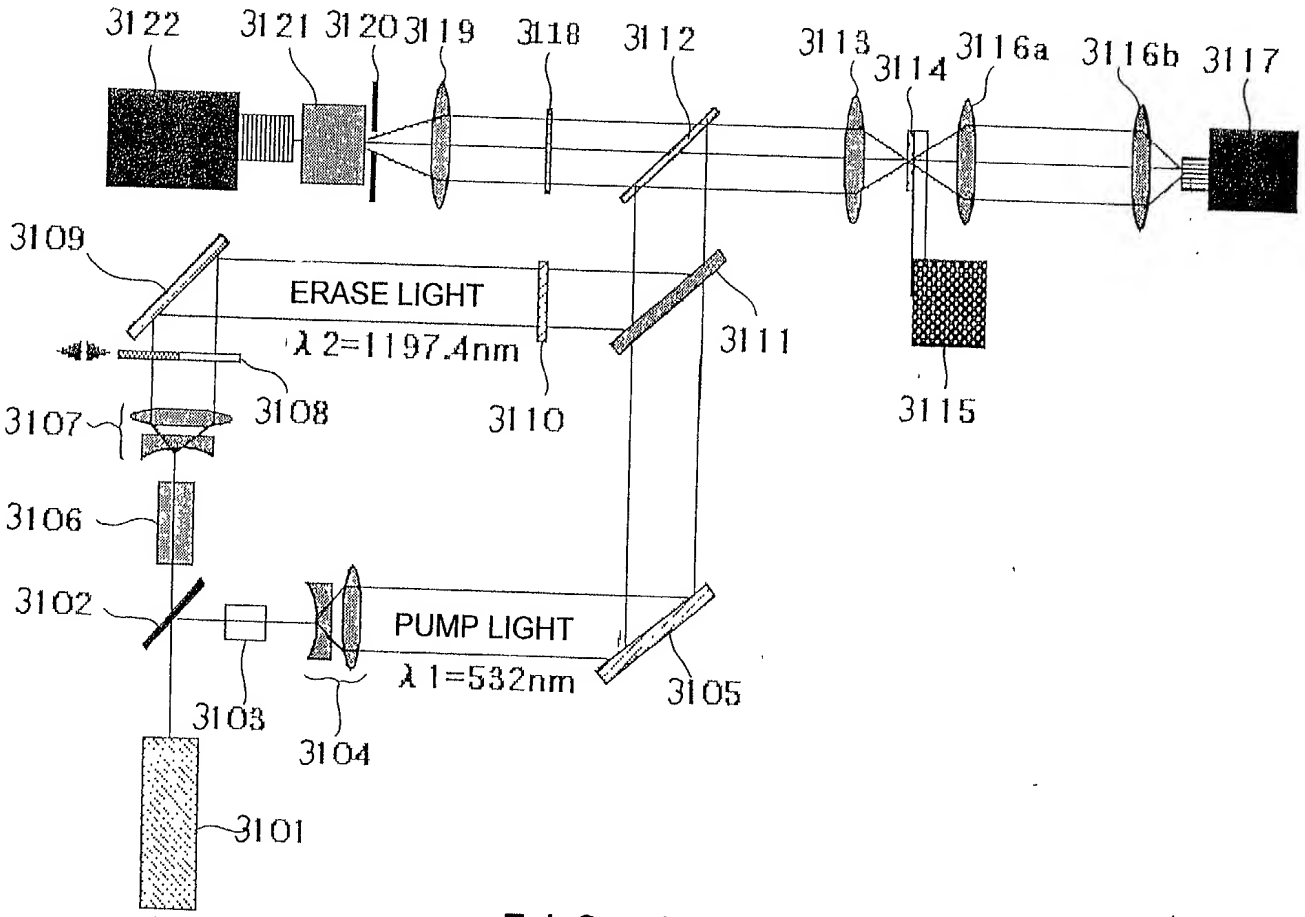


FIG. 45

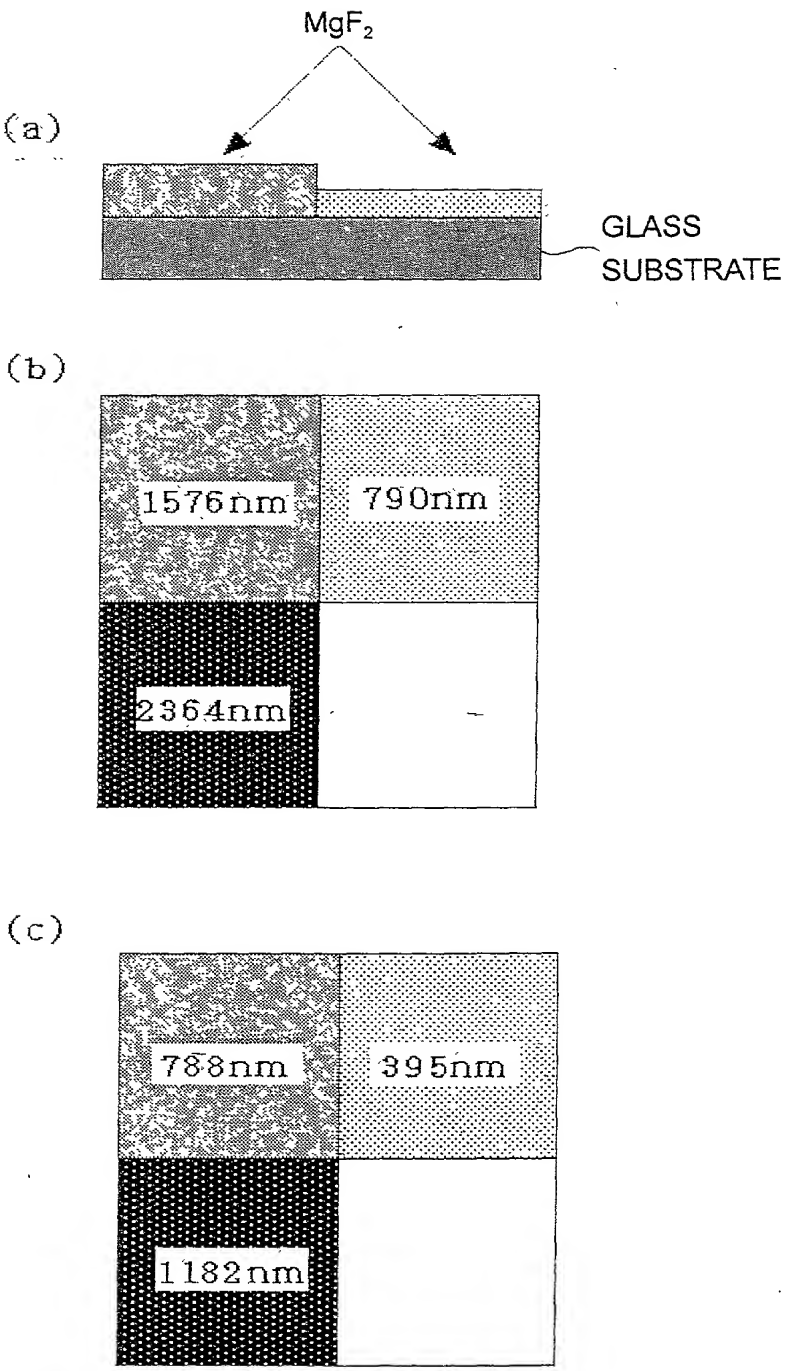

(a)
MgF_2
GLASS
SUBSTRATE
(b)
1576nm
790nm
2364nm
(c)
788nm
395nm
1182nm

FIG. 46

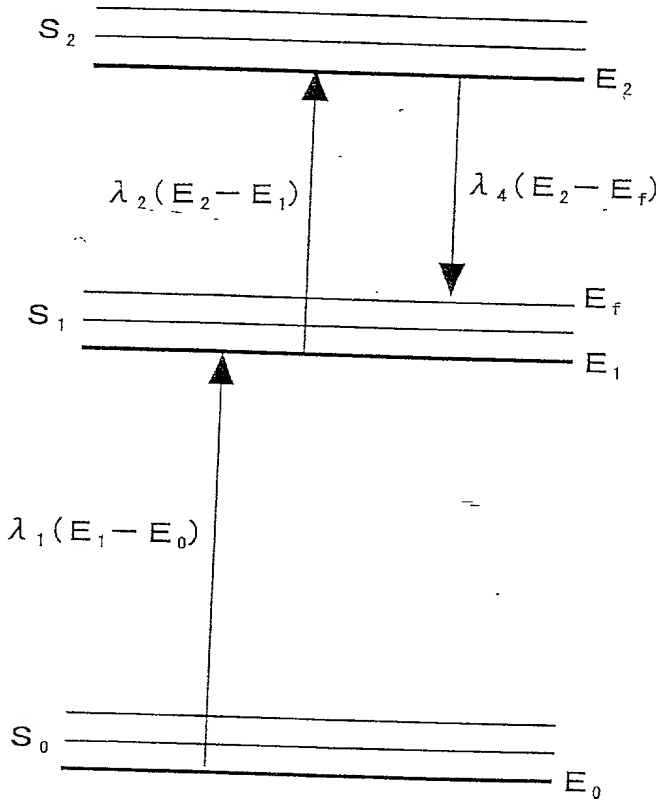


FIG. 47

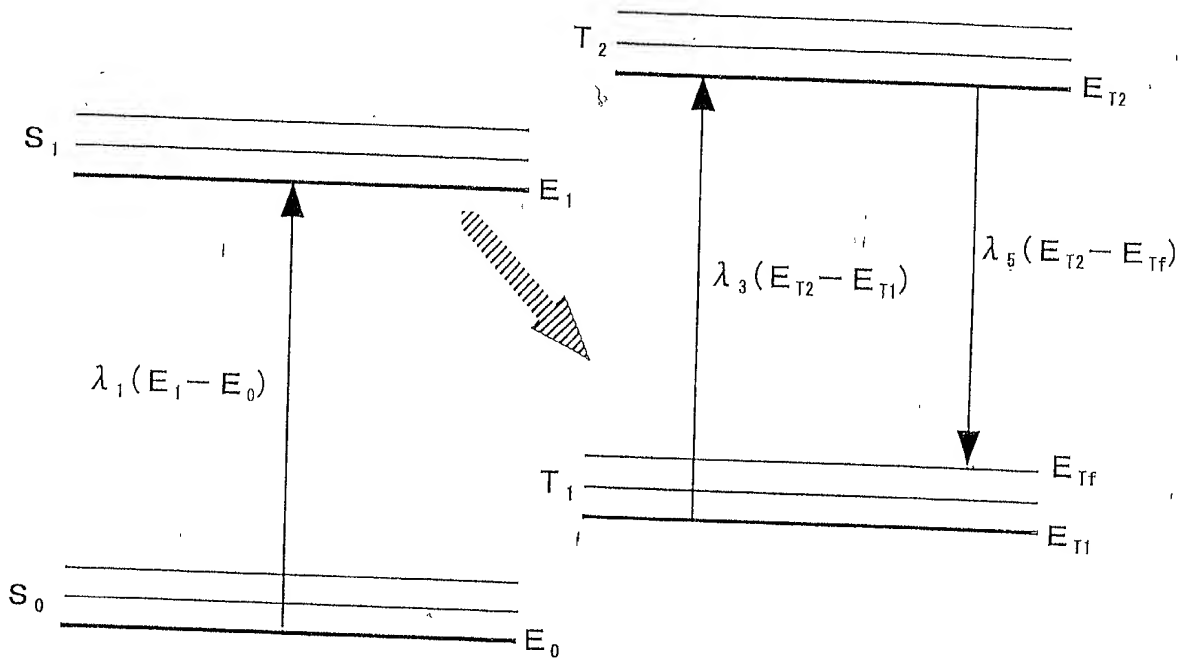


FIG. 48

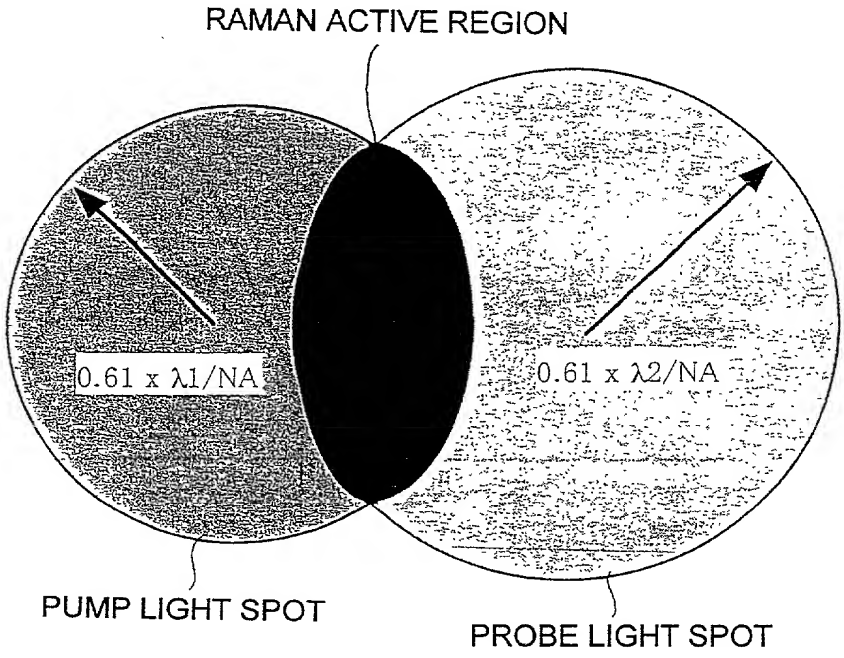

RAMAN ACTIVE REGION
0.61 x λ1/NA
0.61 x λ2/NA
PUMP LIGHT SPOT
PROBE LIGHT SPOT

FIG. 49

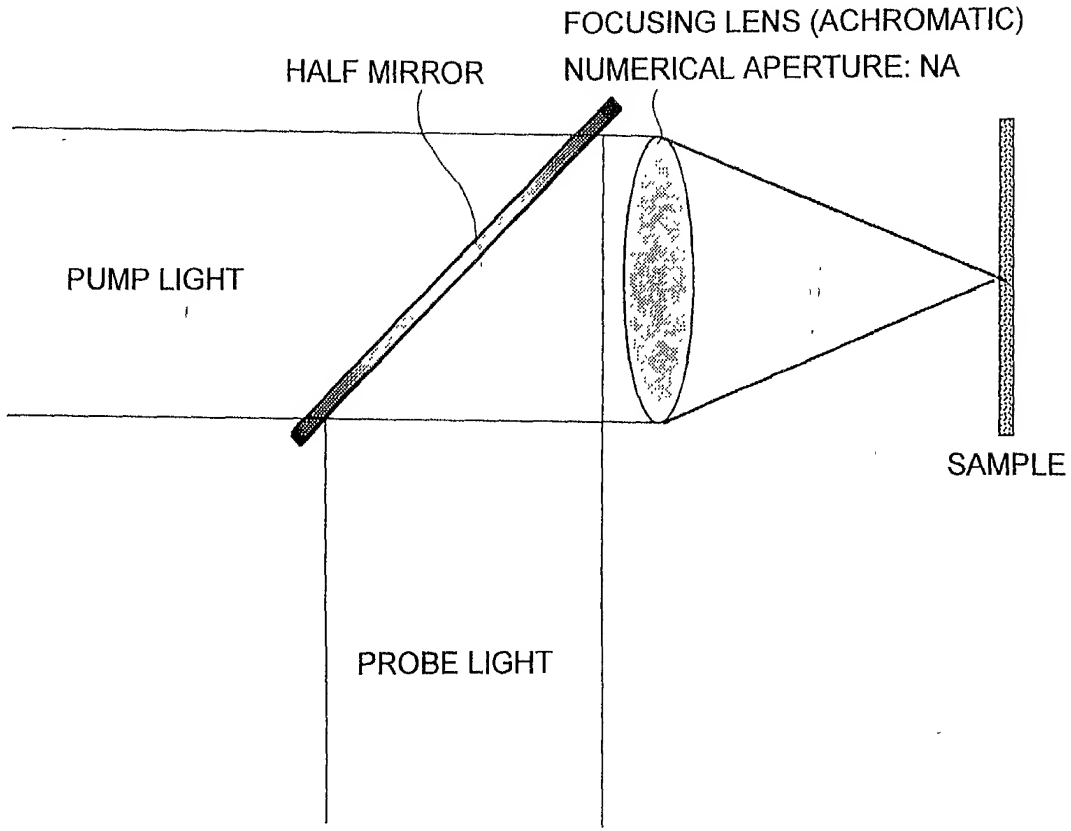


FIG. 50

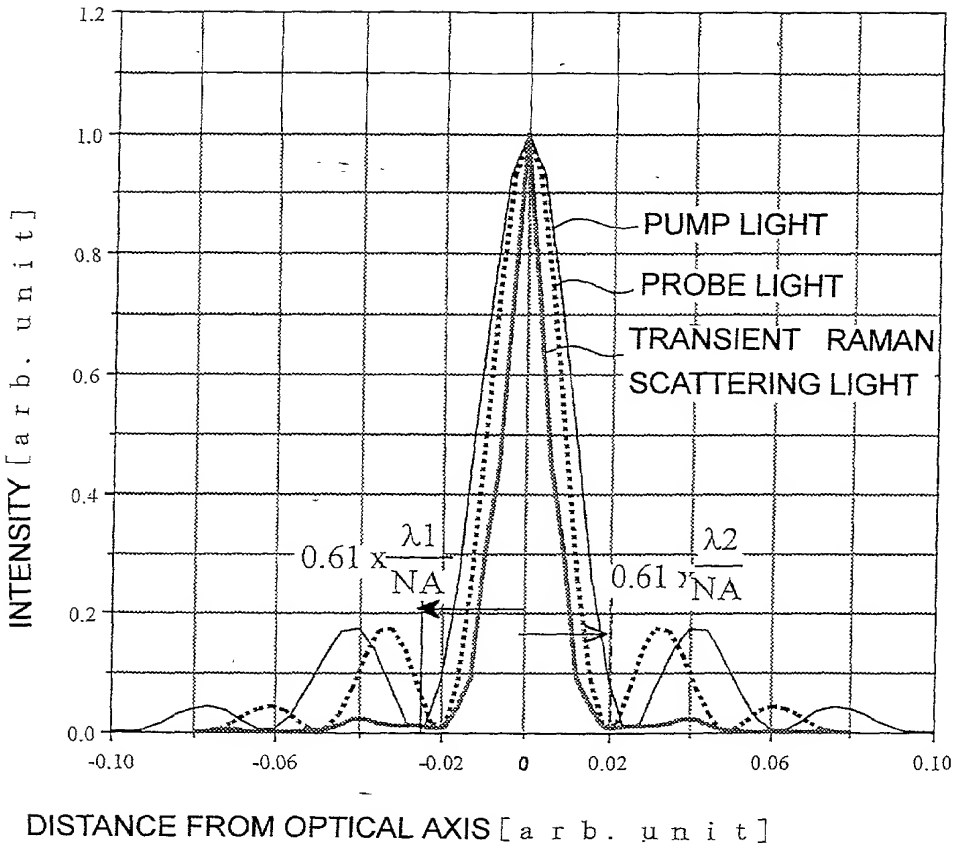
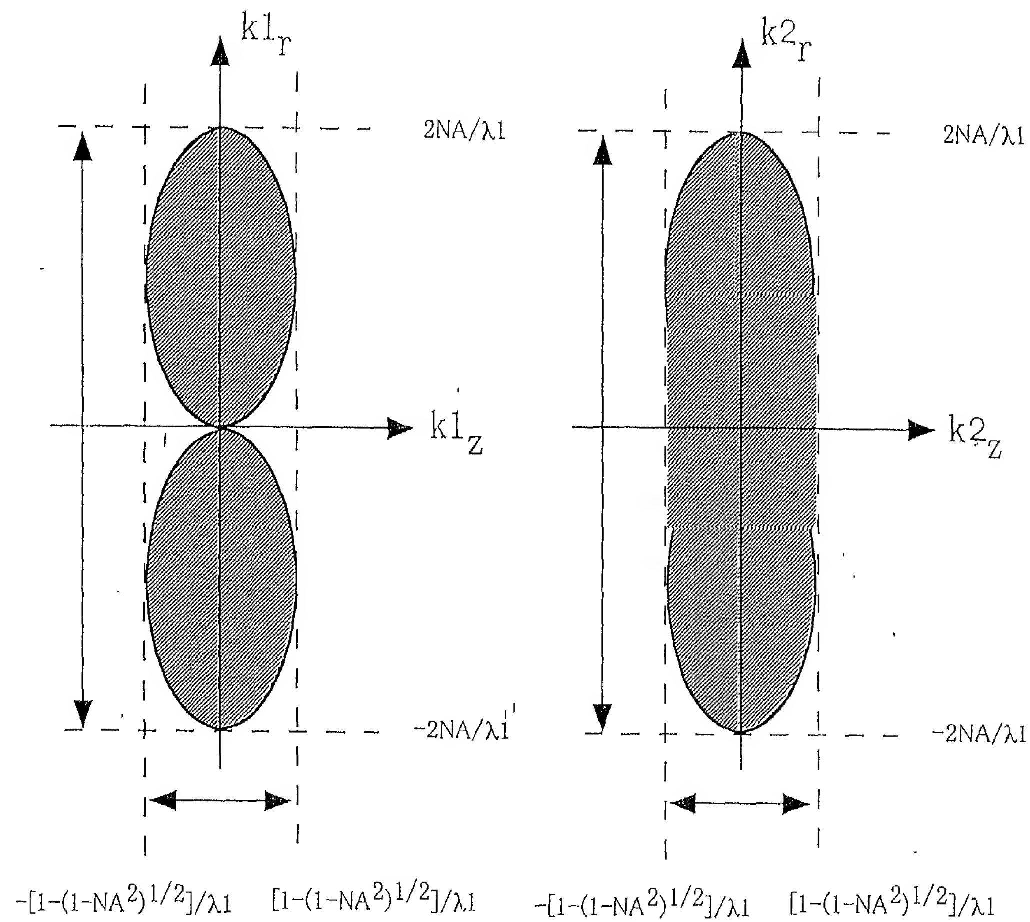

1.2
1.0
0.8
0.6
0.4
0.2
0.0
INTENSITY [arb. unit]
PUMP LIGHT
PROBE LIGHT
TRANSIENT RAMAN
SCATTERING LIGHT
0.61 x λ1/NA
0.61 x λ2/NA
-0.10
-0.06
-0.02
0
0.02
0.06
0.10
DISTANCE FROM OPTICAL AXIS [arb. unit]

FIG. 51



(a) NORMAL ONE-PHOTON EXCITATION PROCESS (b) TRANSIENT RAMAN PROCESS

F I G. 5 2

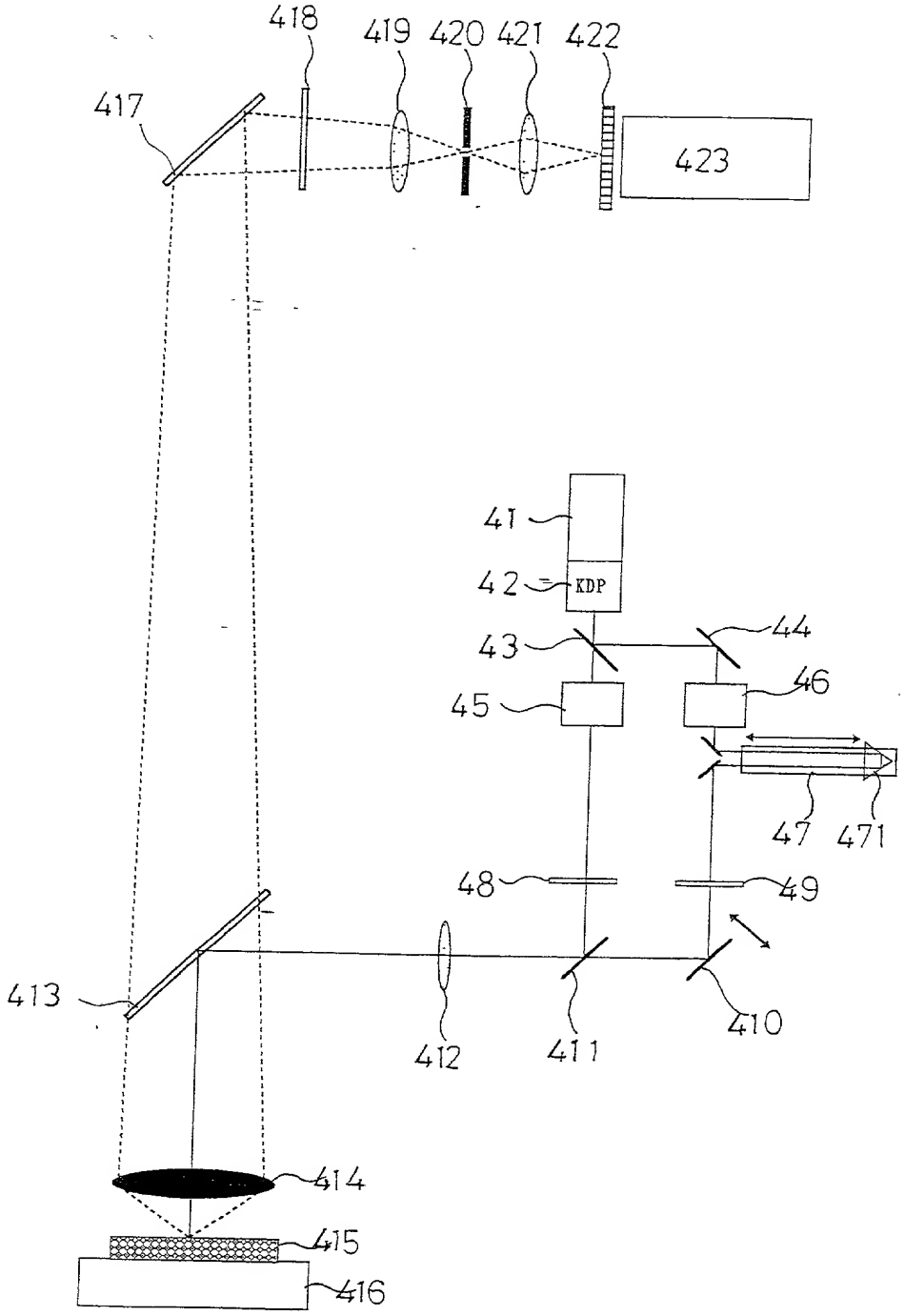

418
419
420
421
422
417
423
41
42
KDP
43
44
45
46
47
471
48
49
413
412
411
410
414
415
416

FIG. 53

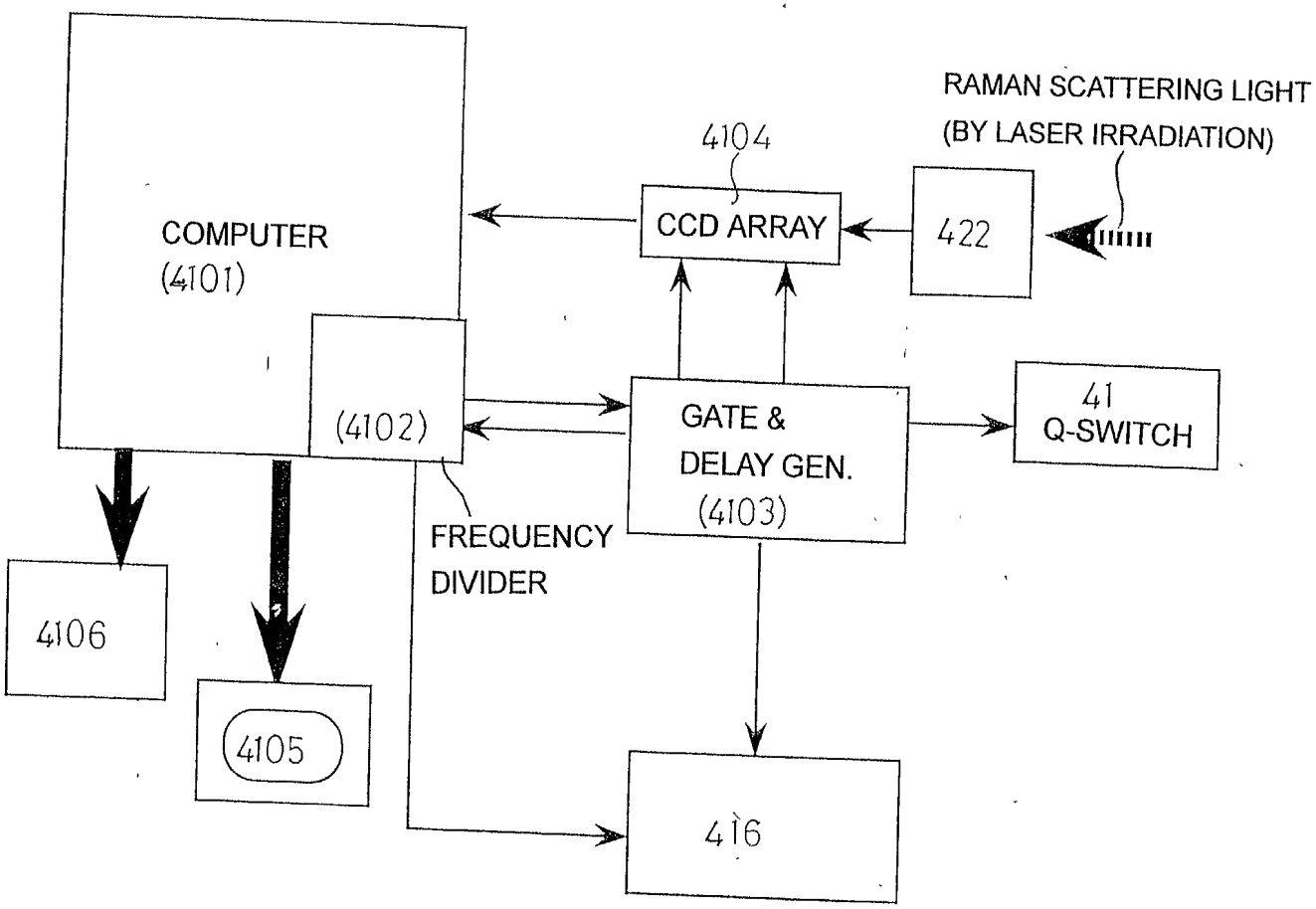


FIG. 54

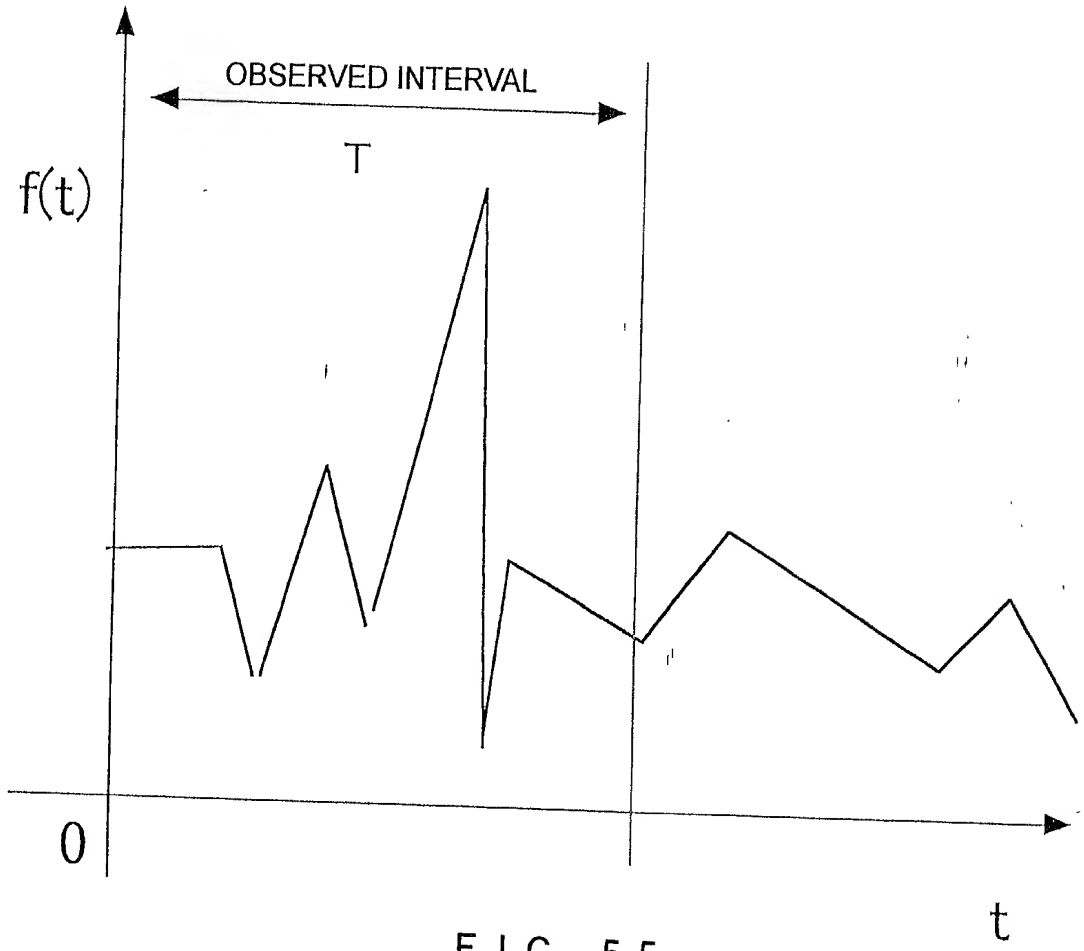


FIG. 55

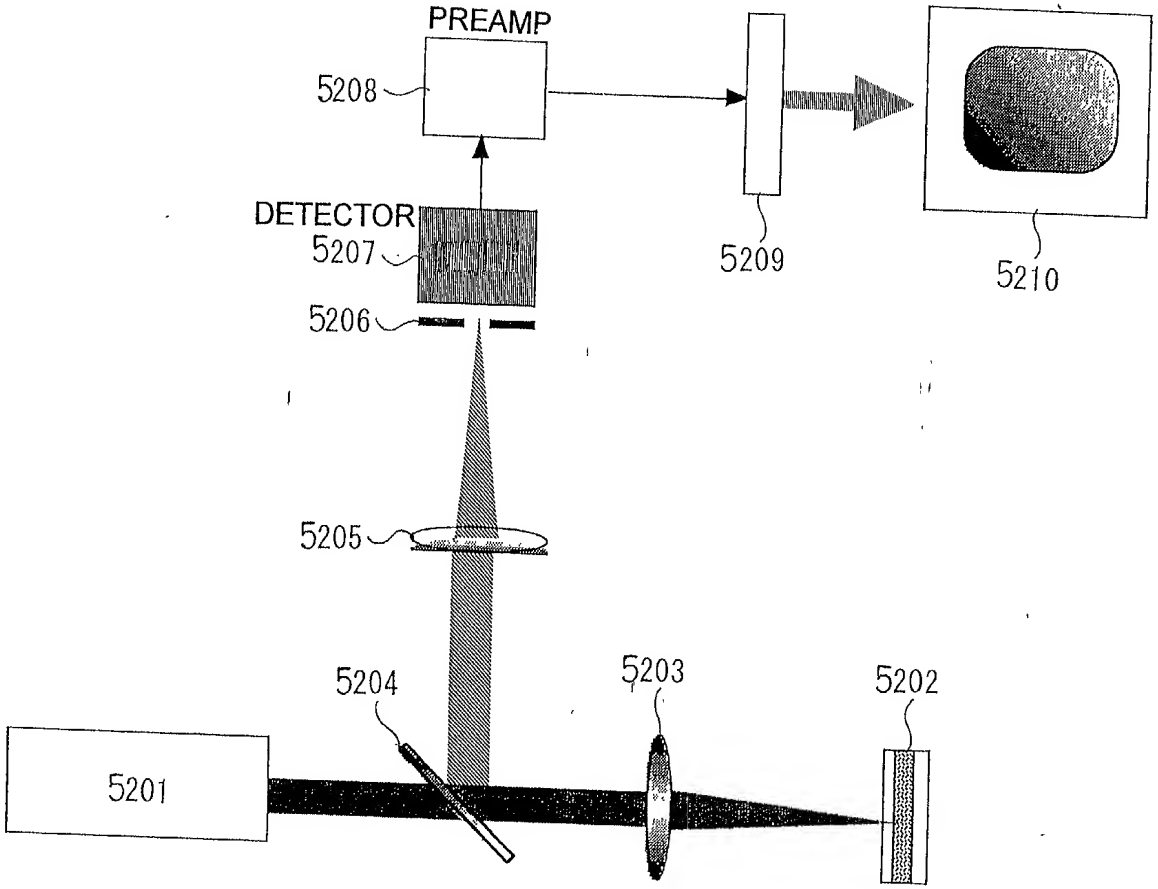

PREAMP
5208
DETECTOR
5207
5206
5205
5204
5203
5202
5201
5209
5210

FIG. 56

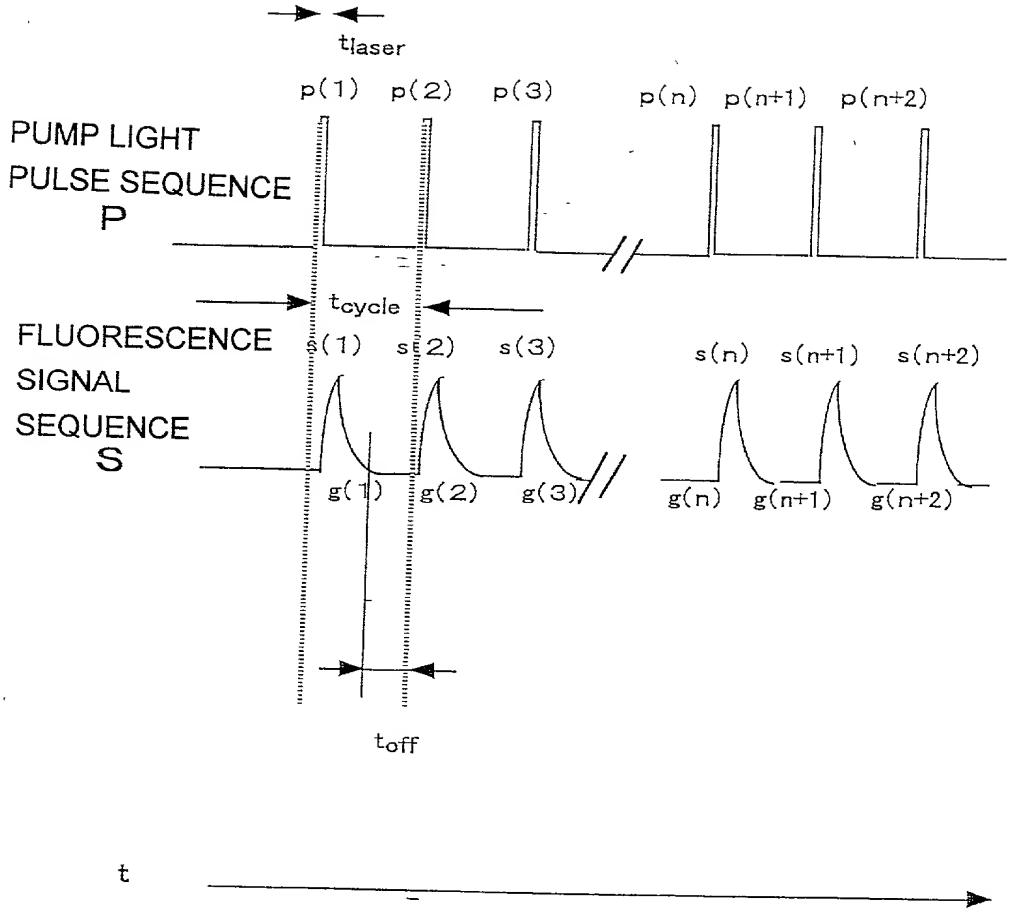

t laser
p(1) p(2) p(3) p(n) p(n+1) p(n+2)
PUMP LIGHT
PULSE SEQUENCE
P
t cycle
FLUORESCENCE
SIGNAL
SEQUENCE
S
s(1) s(2) s(3) s(n) s(n+1) s(n+2)
g(1) g(2) g(3) g(n) g(n+1) g(n+2)
t off
t

FIG. 57

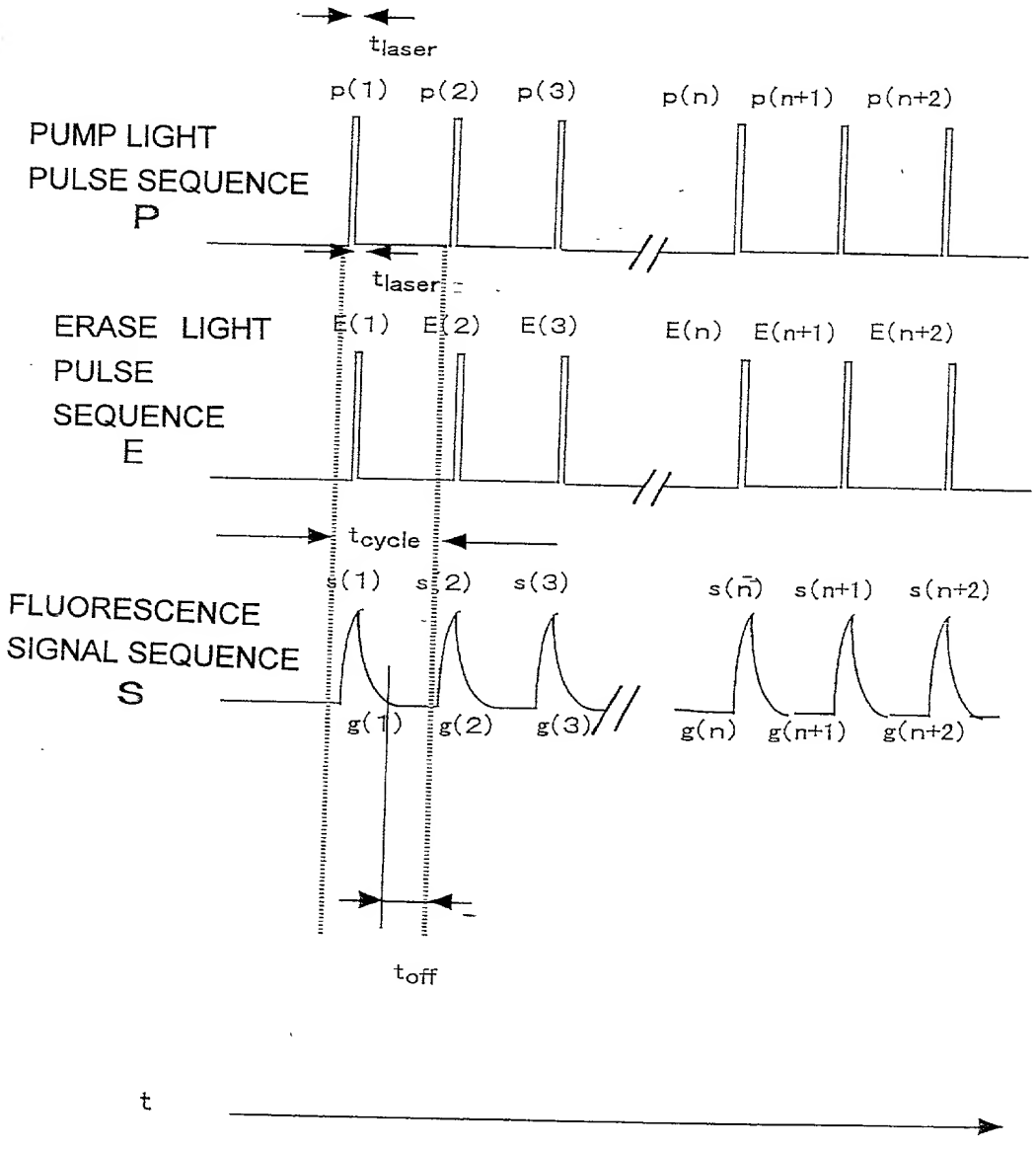

t_{laser}
p(1) p(2) p(3) p(n) p(n+1) p(n+2)
PUMP LIGHT
PULSE SEQUENCE
P
t_{laser}
E(1) E(2) E(3) E(n) E(n+1) E(n+2)
ERASE LIGHT
PULSE
SEQUENCE
E
t_{cycle}
s(1) s(2) s(3) s(n) s(n+1) s(n+2)
FLUORESCENCE
SIGNAL SEQUENCE
S
g(1) g(2) g(3) g(n) g(n+1) g(n+2)
t_{off}
t

FIG. 58

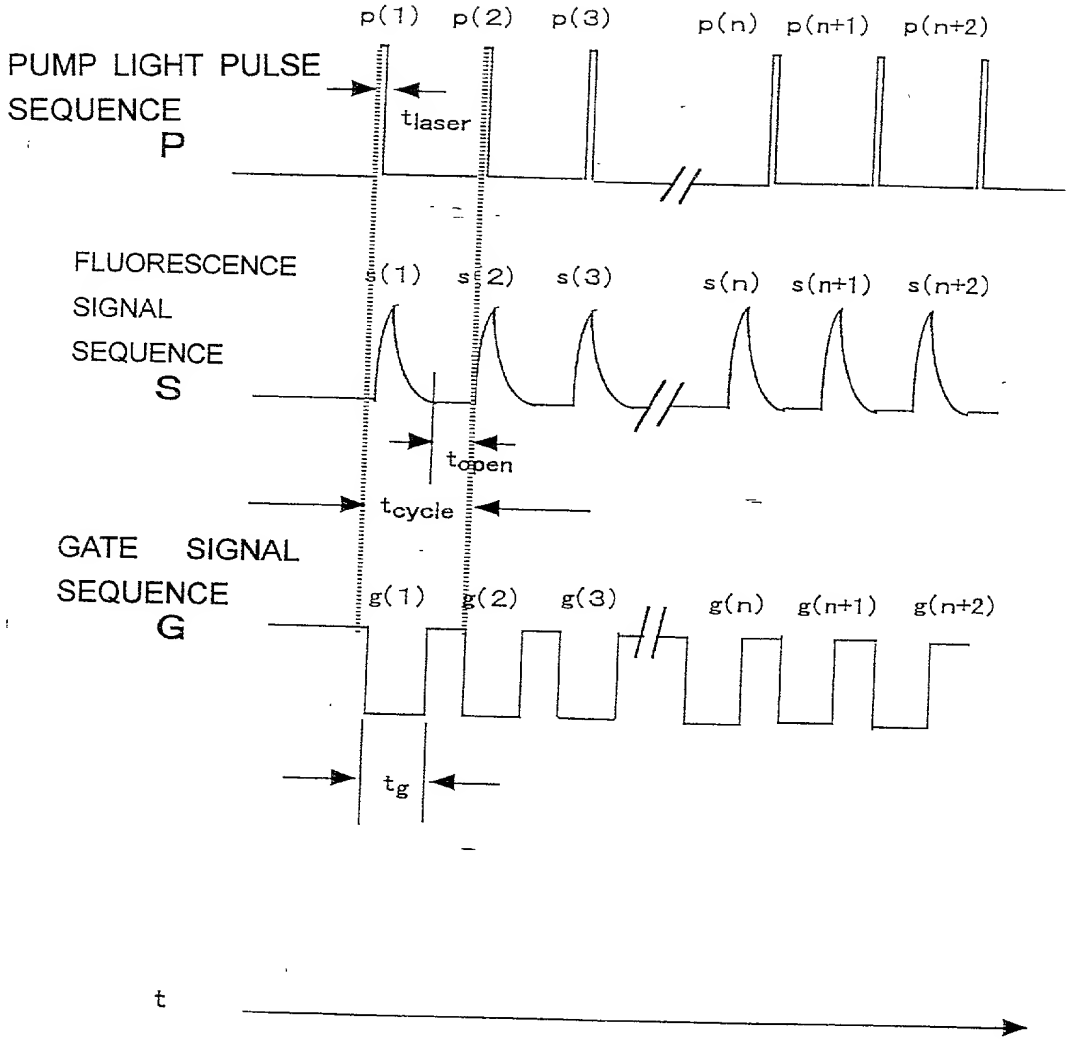

p(1) p(2) p(3) p(n) p(n+1) p(n+2)
PUMP LIGHT PULSE SEQUENCE P
tlaser
FLUORESCENCE SIGNAL SEQUENCE S
s(1) s(2) s(3) s(n) s(n+1) s(n+2)
topen
tcycle
GATE SIGNAL SEQUENCE G
g(1) g(2) g(3) g(n) g(n+1) g(n+2)
tg
t

FIG. 59

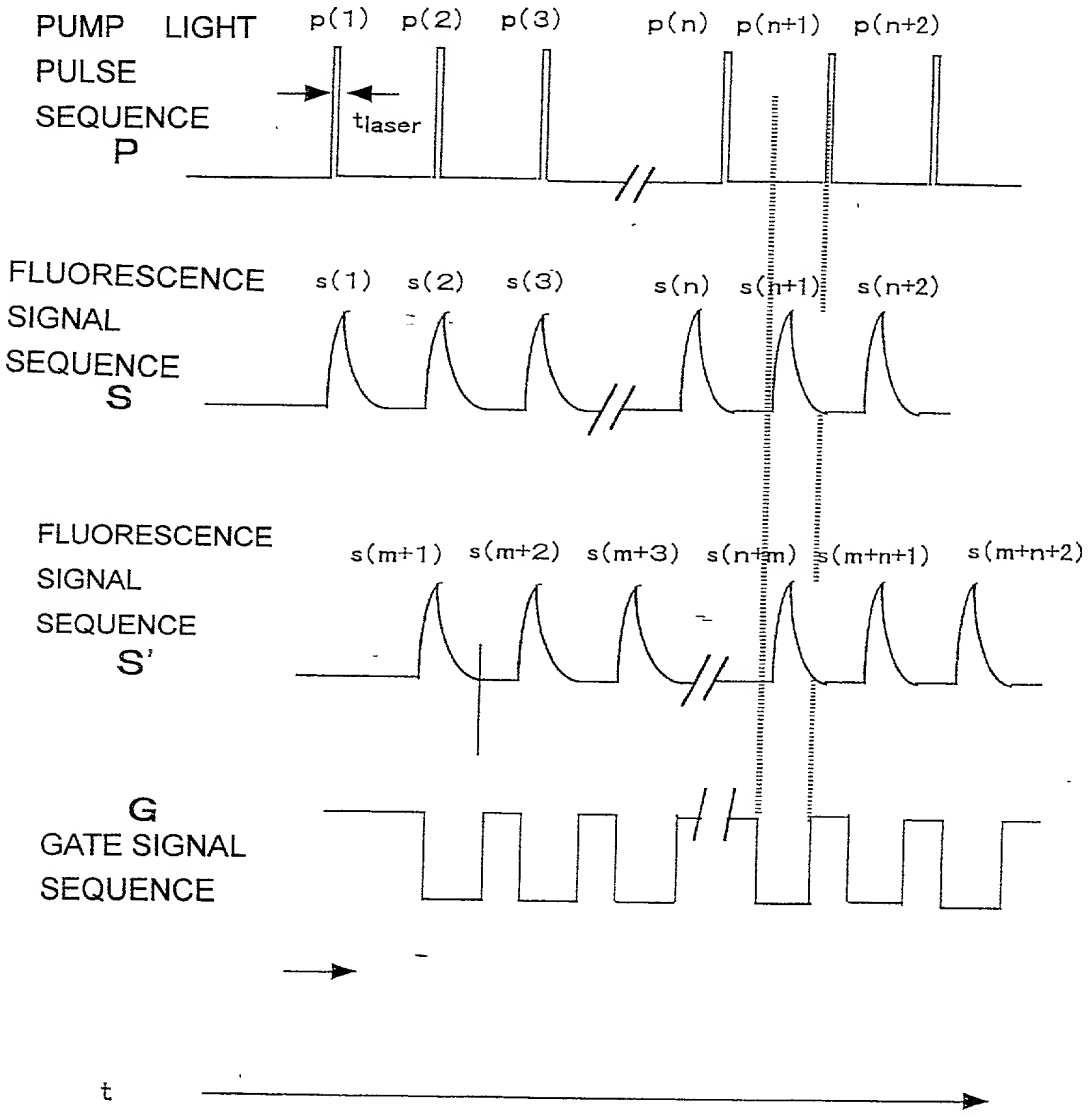

PUMP LIGHT
PULSE
SEQUENCE
P
p(1) p(2) p(3) p(n) p(n+1) p(n+2)
tlaser
FLUORESCENCE
SIGNAL
SEQUENCE
S
s(1) s(2) s(3) s(n) s(n+1) s(n+2)
FLUORESCENCE
SIGNAL
SEQUENCE
S'
s(m+1) s(m+2) s(m+3) s(n+m) s(m+n+1) s(m+n+2)
G
GATE SIGNAL
SEQUENCE
t

FIG. 60

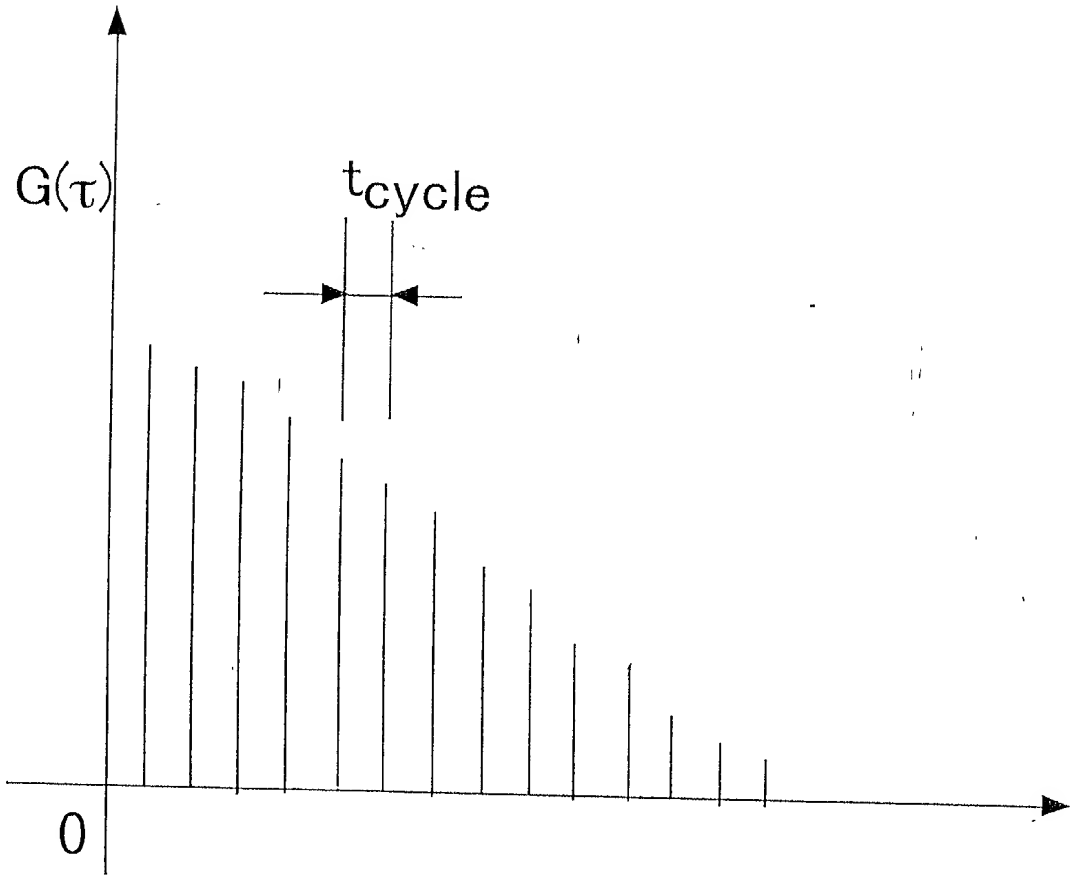


FIG. 61

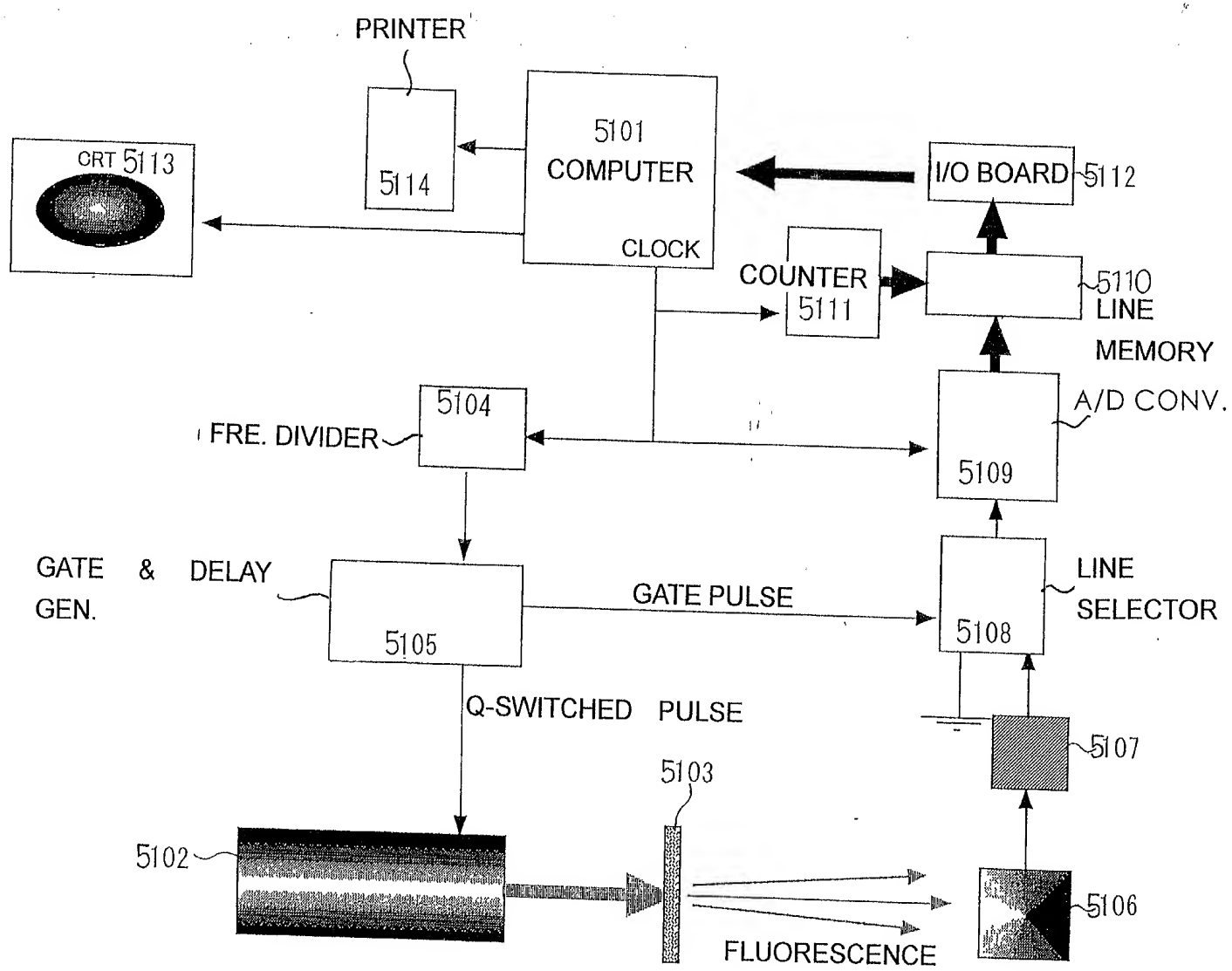

PRINTER
5114
5101
COMPUTER
CLOCK
CRT 5113
I/O BOARD 5112
COUNTER
5111
5110
LINE
MEMORY
A/D CONV.
5109
5104
FRE. DIVIDER
GATE & DELAY
GEN.
5105
GATE PULSE
5108
LINE
SELECTOR
Q-SWITCHED PULSE
5107
5103
5102
5106
FLUORESCENCE

FIG. 62

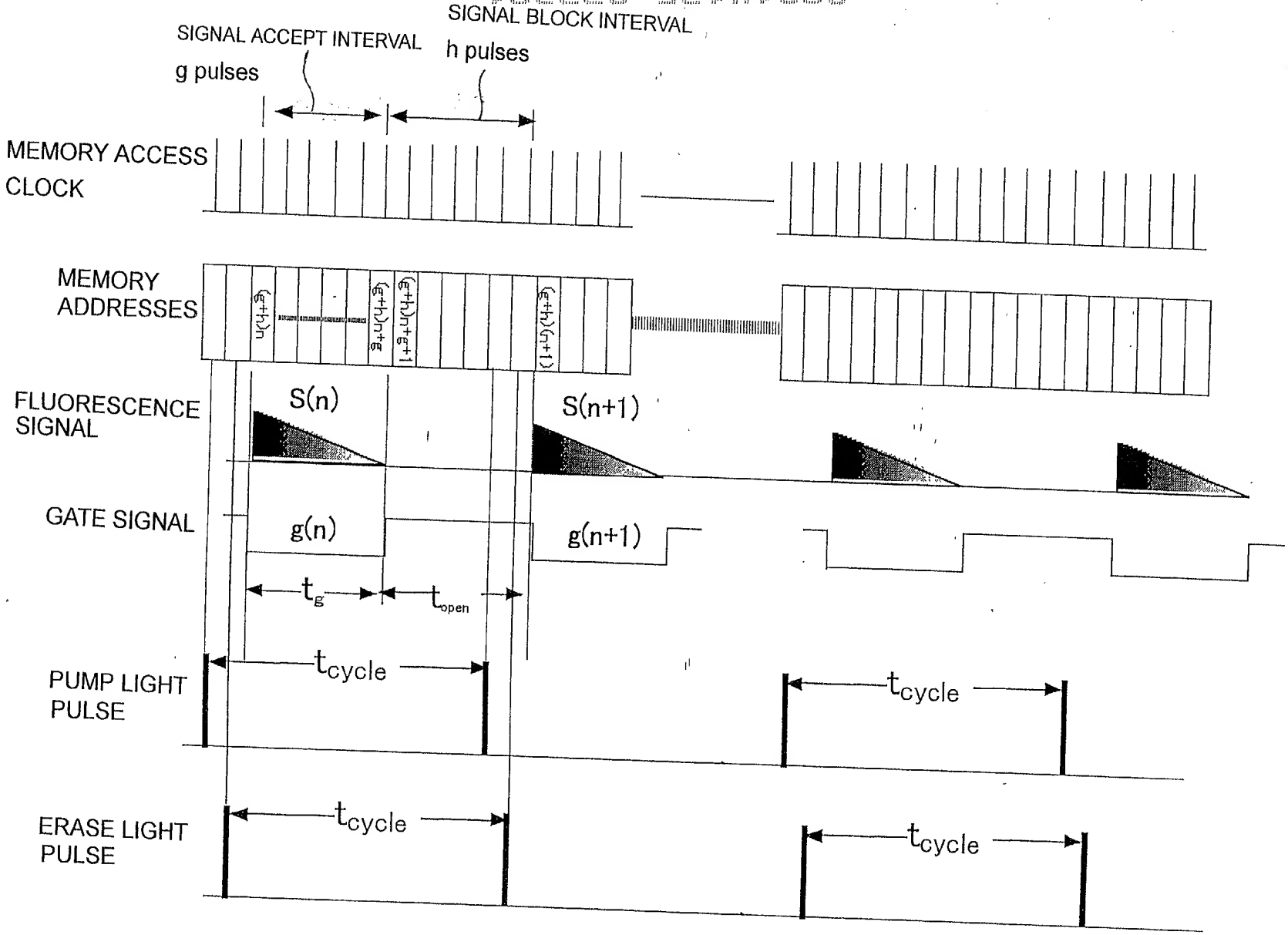


FIG. 63

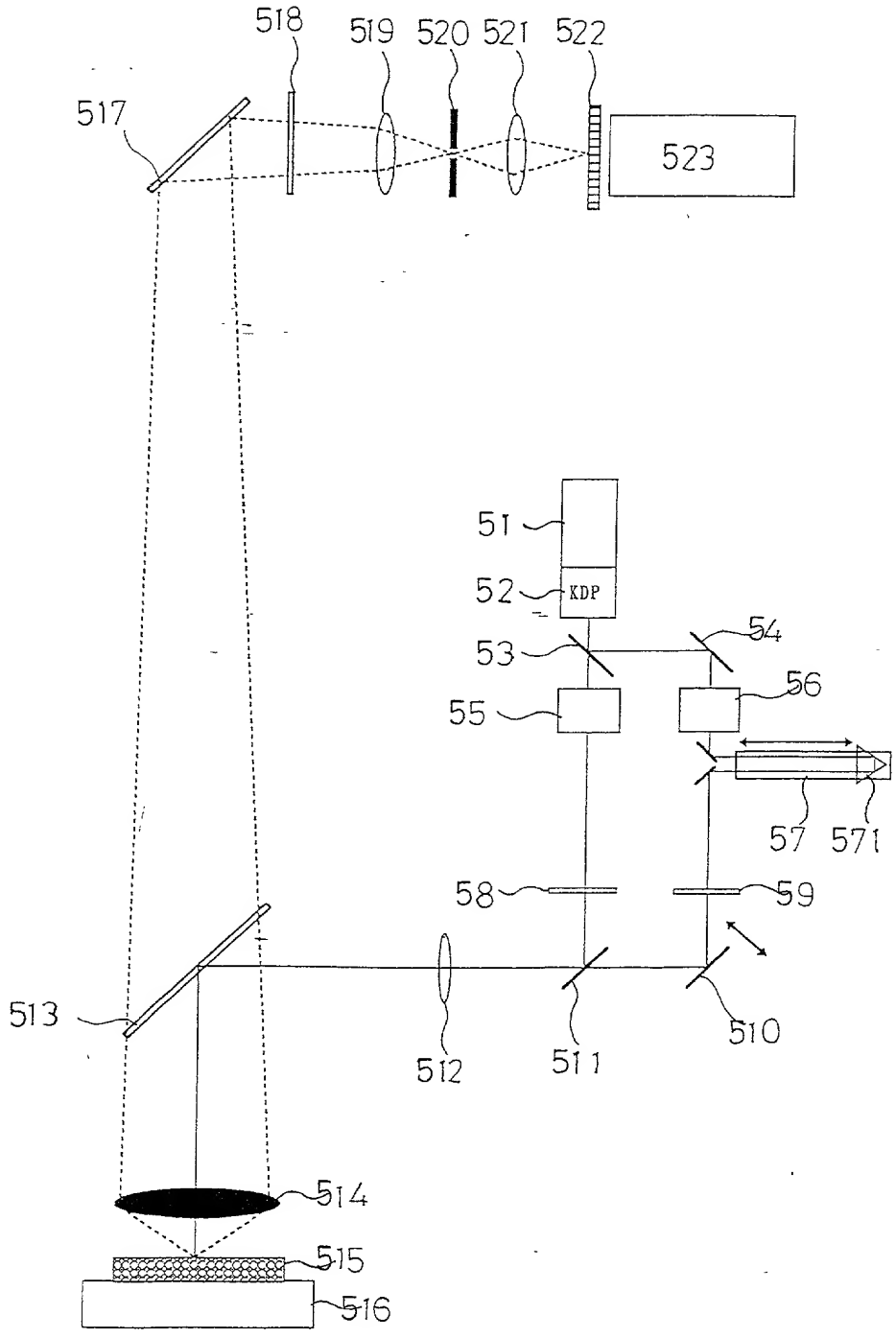

518
519
520
521
522
517
523
51
52
KDP
53
54
55
56
57
571
58
59
513
512
511
510
514
515
516

FIG. 64